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HAND BOOK

Describing

BERLOY BUILDING MATERIALS

FIRST EDITION

BERLOY

PREPARED AND COMPILED BY

BUILDING MATERIALS DIVISION
ENGINEERING DEPARTMENT

THE BERGER MANUFACTURING CO.

CANTON, OHIO, U. S. A.

BRANCH OFFICES

ston, New York, Philadelphia, Chicago, St. Louis, Kansas City,
neapolis, San Francisco, Dallas, Dominion Metal Products Corp.,
Roanoke, Va., Florida Metal Products Co., Jacksonville, Fla.
Export Dept. Berger Bldg., New York, U. S. A.

PRICE $2.00

THIS BOOK CONTAINS

INFORMATION intended to enable Architects and Engineers to design and detail Metal Lumber Joist and Stud construction, also reinforced concrete, and other fire-resistive structures involving the use of Berloy pressed steel structural sections, Floor-cores, Rib-plex, Lath, Centering and Reinforcing Plates.

Also information, (including illustrations) describing details and methods of erection of Berloy pressed steel building materials, and data in connection with materials which enter into construction with Berloy products.

And in addition a short non-technical description of the basic principles involved in the design of beams and joists, and notes describing a simplified manner of designing reinforced concrete beams and joists together with tables tabulating essential designing data.

THE BERGER MANUFACTURING CO.

CONTENTS

CONTENTS

BERLOY

REG. U. S. PAT. OFF.

BERLOY PRODUCTS —the pride of veterans in the craft — exemplify the character, experience and service of lives devoted to constructive progress and excellence.

Ribplex

Metal Lath

Metal Lumber

Floor Cores

Reinforcing Plates

Roofing

Spouting, etc.

Metal Shingles

Bins and Shelving

Foundry Flasks

Filing Cabinets

Clothes Lockers

Metal Ceilings

Culverts

The products shown in heavy type are described in this book

PREFACE

THE BERGER MANUFACTURING COMPANY is and has been a progressive pioneer factor in the development of the pressed steel industry which includes Metal Lumber, Ribbed and Expanded Metal Laths, Reinforcing Plates and Centering, Corner Beads, Wall Ties, Cold Rolled Channels and Floor Cores.

The basic idea of the use of Metal Lumber Joists and Studs according to the best authentic records was conceived by M. H. Crittenden and Frank V. Emery of Minneapolis, Minn., who applied for patents covering the idea on April 3, 1893. The patent was granted to them on April 24, 1894 (No. 518,645).

A few years later extensive experiments and tests were made by The Berger Manufacturing Company under the direction of a Berger Engineer who is still with the company.

These experiments and tests have established Metal Lumber, formed of pressed steel, theoretically designed and correctly detailed, as a successful and practical method of construction.

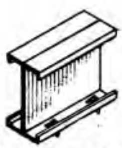
The first building was constructed of Berger Material (essentially as used in present-day practice) in 1907.

The Berger Manufacturing Company was practically the sole manufacturer of pressed steel joists and studs until about 1916, since which date other companies, building on the foundation already established, have entered the field. No essential changes have been made, however, in detail design or methods of construction by their advent into the industry.

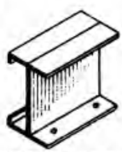
The information contained herein is based upon the years of experience which the company has had in the development of industry, and upon the results of extensive tests by disinter-l experts and laboratories.

erloy Metal Lumber floor and partition construction has been in the erection of thousands of buildings in this and foreign ntries during the past fourteen years in which the material been exploited, manufactured and sold by The Berger Manu-ing Company.

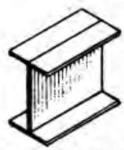
BUILDING MATERIALS



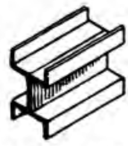
STANDARD I JOIST



SPECIAL I JOIST

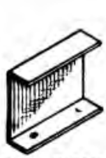


SPECIAL I JOIST



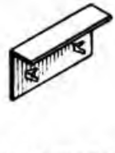
STANDARD LINTEL

STANDARD C JOIST

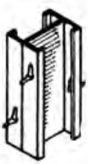


SPECIAL C JOIST

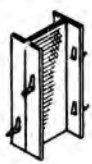
STANDARD RIDGE JOIST



STANDARD WALL RIBBON



STANDARD H STUD



SPECIAL H STUD

STANDARD C STUD

STANDARD C TRACK

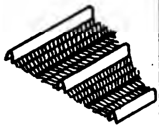
STANDARD "B" CHANNEL STUD

STANDARD "B" CHANNEL SOCKET STRIP

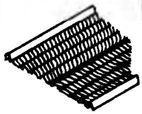
STANDARD "B" U STUD

STANDARD "B" U STUD SOCKET STI

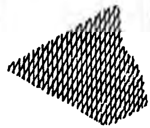
BUILDING MATERIALS



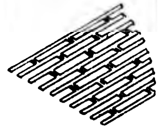
$\frac{3}{4}$" RIBPLEX



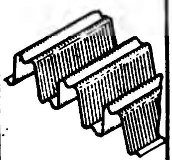
$\frac{3}{8}$" RIBPLEX



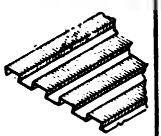
DIAMOND MESH LATH



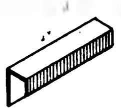
LATTICE SHEET LATH



MULTIPLEX PLATE



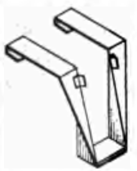
FERRO-LITHIC PLATE



TOP TRACK FOR $\frac{3}{4}$" RIBPLEX

BEAM CLIP

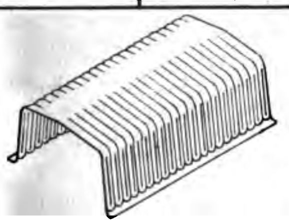
CORNER BEAD



JOIST HANGER

BOTTOM TRACK FOR $\frac{3}{4}$" RIBPLEX

BEAM FURRING CLIP



ORRUGATED STEEL FLOOR CORE

CURVED RIBPLEX

BERLOY BUILDING MATERIALS

The reputation so thoroughly established for Berloy products is maintained by the high standards of design and production required by the company. Control of Berloy products from the ore to the finished product assures the purchaser of the very best material which is available.

The Berger Manufacturing Company sells personal service with its Berloy products. While complete data for design is included in this hand book to enable architects and engineers to prepare their plans, this company prepares and furnishes (subject to approval of the architect) in connection with shipment of materials, erection drawings to insure the proper placing of the pressed steel members, each piece of which is cut to fit, and marked to correspond with the identification marks indicated on erection diagrams.

This complete service by the manufacturer eliminates divided responsibility as to the integrity of the materials of construction. The preparation of these additional detail drawings also serves as a check to the design.

Metal Lumber joists and studs were first introduced to replace wood in building structures. While admirably adapted to such purposes the field of its use has expanded to the extensive replacement of the heavier types of fire-resistive construction for buildings with light live load requirements.

The simple, yet positive, details of design, based upon recognized basic principles of engineering, light weight, ease of erection and inspection, adaptability and durability have given a front rank place to Berloy pressed steel types of construction.

Berloy pressed steel is of special analysis and is a produ rolled and rerolled under great pressure and receiving a suffici number of rollings under this compression to finally produce t best grade of pressed steel.

A feature distinctive to pressed steel sections is the realizi of the advantage of the increased tensile value of steel at te peratures ranging from about 250° to 1000° F.

FIRE RESISTANCE

The fundamental principle upon which the wonderful growth of business of the Building Materials Division of The Berger Manufacturing Company has been developed is the production and exploitation of fire-resistive materials for building construction.

The efforts of specialists in the Division, the extensive tests made for the Company by disinterested experts and the membership of the Company or members of its staff of engineers in the National Fire Protection Association, The American Concrete Institute, The American Society of Civil Engineers, The American Society for Testing Materials, The Associated Metal Lath Manufacturers, and other organizations, keep us in direct touch with the latest developments and most advanced thought in this most important field.

The essence of the effort and thought along the lines of fire-resistance is directed towards fire prevention. We find this keynote recognized and clearly stated in the recently published "Hand Book of Fire Protection" by Crosby, Fiske and Forster, sixth edition (D. Van Nostrand Co.), in Chapter 1, paragraphs 1 and 2 as follows:

> "The readers of this book are unquestionably familiar in a general way, with the tremendous fire waste of this country. It is a waste made of the destruction and damage of property by fire, water, and smoke, of the cost of public and private fire protection, of the conduct of the insurance business, and of law making, inspection, and allied costs which

states and cities incur. In round figures the fire waste and the attendant costs have been placed at approximately $500,000,000 per year. A very considerable life loss and much suffering and disfigurement also result from our fire waste.

Something like 250,000 fires are reported per year, most of which are due to carelessness or ignorance. All were small at the start and therefore subject to control, *and practically all, by proper building construction and arrangement and by adequate protection, could have been prevented from causing appreciable damage.*"

It is the duty of Architects and Engineers to thoroughly investigate the subject of the types of construction and uses of materials which will produce structures of maximum safety and fire-resistive qualities.

We present this hand book which is based essentially on the exploitation and explanation of the best types of materials for such purposes.

We also take pleasure in offering the services and advice of our engineering department and specialists to engineers and owners in the preparation of plans for and building of fire-safe buildings.

PRESSED STEEL

Structural Members.—In Metal Lumber floor and roof construction the load-supporting joists and studs are of pressed steel, which by reason of its nature and the design of the section provides a material of maximum strength and permanence as well as steel in the form which is least injuriously affected by very high temperatures.

Maximum Strength.—The requirement as to tensile strength for Berloy load-bearing pressed steel members is the same as for standard structural steel shapes. Extensive tests made for the company by disinterested parties have demonstrated the fact that the same basic laws as to calculation of the strength of structural steel shapes apply also in pressed steel sections. Tests to destruction show similar results, both as to maximum value and nature of failure.

Permanence.—In the rolling of sheets for pressed steel the metal is much more thoroughly and uniformly worked than in any other rolled shape. This thorough mechanical working produces a material of uniform fine grain structure, maximum density and freedom from strains. This eliminates irregularity of structure which is well known to be a prevalent cause of corrosion.

The surface of pressed steel sections is very smooth and this, added to the great density of the steel, presents practically an impregnable barrier to tendencies to rust or corrode. In addition to the above the Metal Lumber is hand dipped in special rust resisting paint after fabrication.

The presence of water or condensation of moisture on the itself is necessary to cause corrosion. This cause, how- is eliminated in floor and partition construction as the s in construction are positioned between a plaster ceiling and ıished floor, and studs between two coats of plaster, both of :h are practically dead air spaces which will not cause con- ıtion. Furthermore, the material is protected by the coating ·ıt.

BERLOY METAL LUMBER

SECTIONS OF PRESSED STEEL SHAPES FOR BU LDING CONSTRUCTION

16 Revised—See page 2 of addenda.

Thickness.

Thickness of material from which Berloy Me umber load-bearing sections are formed varies from .072 in o .120 inches, and noted as "A" material.

Sections noted as "B" material are of 1 20 gauge (U. S. Standard), and designed for non-bearing ions, ceiling members, furring, etc.

Length.

The maximum length of 60′ 0″ h n established because of shipping limitations.

The lengths of certain secti hich can be furnished without splicing are limited, for t owing reasons:

First, because the format the .120 inch thickness sections requires the greater stren f a vertical press over that available in the roll formin hinery, therefore these lengths are limited to the dimensi the press.

Second, because m l as light as .072 inch thickness cannot be rolled commerc n the wider widths in strip mills, therefore these length limited to sheet lengths.

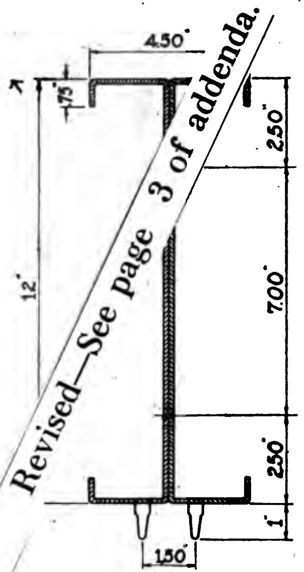
The shorter s may be increased by splicing the sections. These splices located at different places staggered on each side of the which is made possible by the fabrication of I joists f wo separate channels. Splices are designed to more th velop the full strength of the section.

Permis Variations.

All le variation in length, ⅜ inch plus or minus unl ord cut exact for specific building schedules. Allowal v n in weight 2½ per cent plus or minus, based on p weights.

BERLOY METAL LUMBER

STANDARD 12 INCH PRESSF ...EEL I JOISTS ("A")



Revised—See page 3 of addenda.

Code ...rd	...es	Weight per foot in lbs.	Flange width in inches	Flange thickness in inches	Web thickness in inches	Length
sk	12	12.7	4½	.109	.218	60'0"
tl	12	8.4	4½	.072	.144	16'8"*
wn	12	14.0	4½	.120	.240	12'6"*

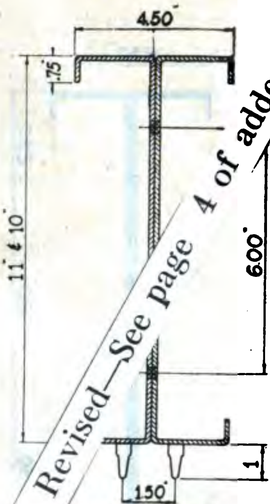
17

he ... gths can be increased by splicing.

... sections .072 thickness may be pronged for lath, heavier sec- ...y have ⅜ inch holes punched in lower flange for wiring lath

BERLOY METAL LUMBER

STANDARD 11 AND 10 INCH PRESSED S L I JOISTS ("A")



Revised—See page 4 of addenda.

18

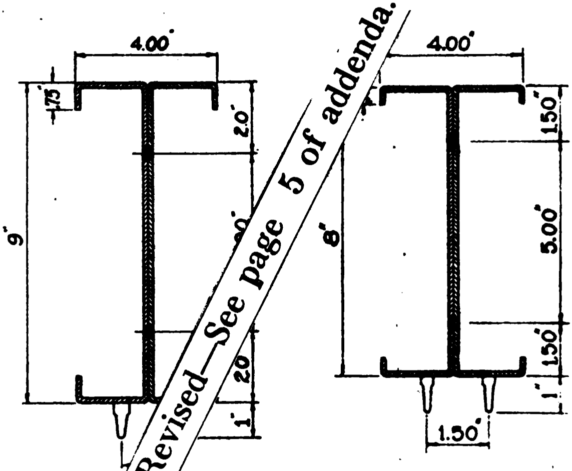
Code word	Depth in inches	ight r foot n lbs.	Flange width in inches	Flange thickness in inches	Web thickness in inches	Length
zebar	11	12.0	4½	.109	.218	60′0″
zebit	1	7.9	4½	.072	.144	16′8″*
zebov		13.2	4½	.120	.240	12′6″*
zebse		9.5	4½	.092	.184	60′0″
zebvo		7.4	4½	.072	.144	16′8″
zebyx		12.4	4½	.120	.240	16′8″

* Thes ths can be increased by splicing.

Stan sections .072 and .092 thickness may be pronged for lat hea sections may have ⅜ inch holes punched in lower flange f wi ath thereto.

BERLOY METAL LUMBER

STANDARD 9 AND 8 INCH PRE STEEL I JOISTS ("A")



Revised—See page 5 of addenda.

Code word	D	Weight per foot in lbs.	Flange width in inches	Flange thickness in inches	Web thickness in inches	Length
zecas	[illegible]	8.3	4	.089	.178	60'0"
zecet	[illegible]	6.7	4	.072	.144	16'8"*
zeciv	9	11.2	4	.120	.240	16'8"*
csa	8	6.0	4	.072	.144	60'0"
cte	8	10.0	4	.120	.240	16'8"*

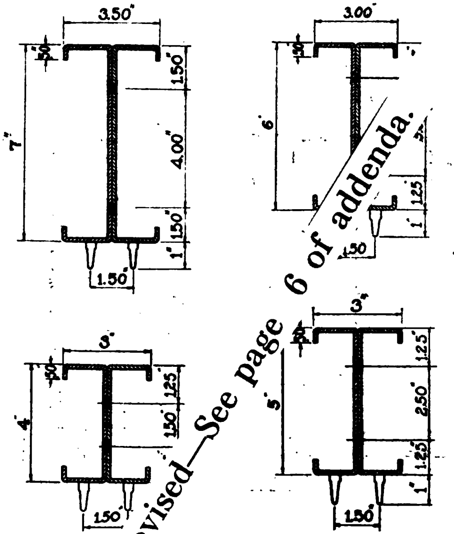
19

ngths can be increased by splicing.

rd sections .072 and .089 thickness may be pronged for lath, r sections may have ⅜ inch holes punched in lower flange iring lath thereto.

BERLOY METAL LUMBER

STANDARD: 7, 6, 5 AND 4 INCH PRESSED STEEL I JOISTS ("A")



Revised—See page 6 of addenda.

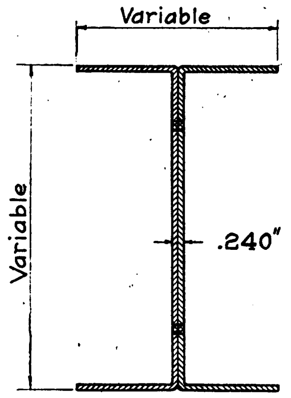
Code word	Depth in inches	We[illegible] per [illegible]	Flange width in inches	Flange thickness in inches	Web thickness in inches	Length
zecux	7	[illegible]	3½	.072	.144	60'0"
zecwo	7	[illegible]8	3½	.120	.240	16'8"*
zeczy	6	[illegible].6	3	.072	.144	60'0"
zedat	6	7.6	3	.120	.240	16'8"*
zedev	[illegible]	4.1	3	.072	.144	60'0"
zedoy	[illegible]	6.8	3	.120	.240	16'8"*
zedta	[illegible]	3.6	3	.072	.144	60'0"
zeduz	[illegible]	6.0	3	.120	.240	16'8"*

* These [illegible]hs can be increased by splicing.

Stan[illegible] sections .072 thickness may be pronged for lath, heavier sec tio[illegible] [illegible]y have ⅜ inch holes punched in lower flange for wiring lat t[illegible] [illegible].

BERLOY METAL LUMBER

SPECIAL PRESSED STEEL I JOISTS ("A")



These special I joists are made ¼ inch oversize when used for headers, and ½ inch oversize when used for trimmers, see pages 96 and 97.

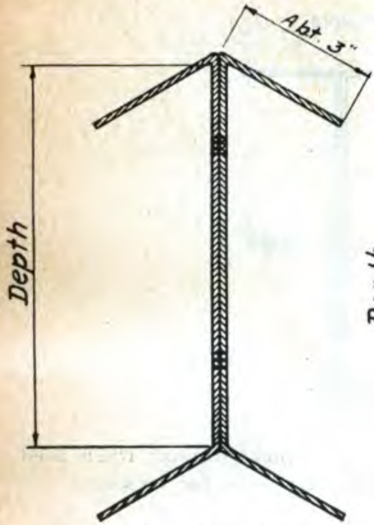
For standard joists, depth in inches	Weight per foot in lbs.	Approximate flange width in inches	Flange thickness in inches	Web thickness in inches	Length
12	14.0	6	.120	.240	16′8″*
11	13.2	6	.120	.240	16′8″*
10	12.4	6	.120	.240	16′8″*
9	11.2	5½	.120	.240	16′8″*
8	10.0	5	.120	.240	16′8″*
7	8.8	4½	.120	.240	16′8″*
6	7.6	4	.120	.240	16′8″*
5	6.8	4	.120	.240	16′8″*
4	6.0	4	.120	.240	16′8″*

ıese lengths can be increased by splicing.

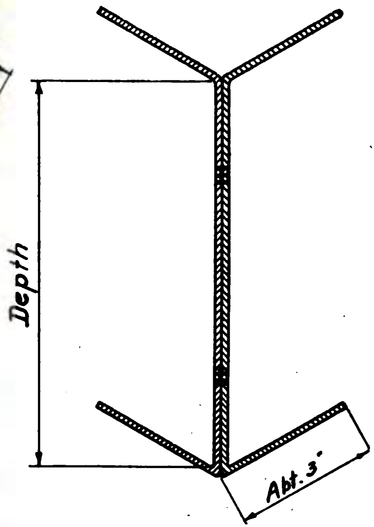
er flanges may have ⅜ inch holes punched for wiring lath thereto sired.

BERLOY METAL LUMBER

SPECIAL PRESSED STEEL HIP, RIDGE AND VALLEY SECTIONS ("A")



Special Hip or Ridge Member



Special Valley Member

Furnished in .072 inch and .120 inch flange thicknesses. Angle of flange bent to suit details of construction.

The depth equals the bevel cut length of the rafter joists plus ⅛ inch.

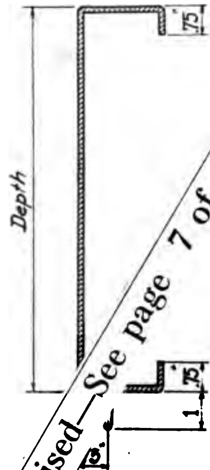
The strength of the section can be assumed for all practical purposes to be the same as that of standard joists with the same depth of web.

Lengths.—Where the depth of the web plus 3 inches is ı over a total of 14½ inches, 16′ 8″ lengths can be furnished wi out splices. When the depth of the web plus 3 inches is grea than 14½ inches the lengths cannot exceed 12′ 6″ without splic These lengths can be increased by splicing.

Details of the design of roofs involving this type of memb are given in the chapter on Details of Design.

BERLOY METAL LUMBER

STANDARD 12, 11, 10 AND 9 INCH PRESSED [illegible]EL CHANNEL JOISTS ("A")



Revised—See page 7 of addenda.

Code word	Depth in inches	[illegible]t [illegible]ot [illegible]bs.	Flange width in inches	Thickness in inches	Length
zedve	12	[illegible].35	2¼	.109	60′0″
zedyo	12	4.2	2¼	.072	16′8″*
zeebs	12	7.0	2¼	.120	12′6″*
zeect	1[illegible]	6.0	2¼	.109	60′0″
zeegy	[illegible]	3.95	2¼	.072	16′8″*
zeeld	[illegible]	6.6	2¼	.120	12′6″*
zeemf	[illegible]	4.75	2¼	.092	60′0″
zeeng	[illegible]	3.7	2¼	.072	16′8″*
[illegible]h	[illegible]0	6.2	2¼	.120	16′8″*
[illegible]k	9	4.15	2	.089	60′0″
[illegible]wp	9	3.35	2	.072	16′8″*
[illegible]v	9	5.6	2	.120	16′8″*

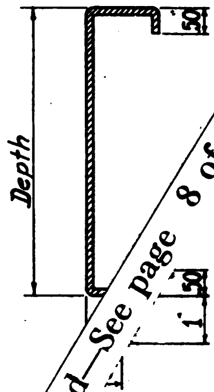
* [illegible]gths can be increased by splicing.

[illegible] sections .072, .089 and .092 thickness may be pronged for [illegible]avier sections may have ⅜ inch holes punched in lower flange [illegible]ring lath thereto.

23

BERLOY METAL LUMBER

STANDARD 8, 7, 6, 5, AND 4 INCH PRESSE[illegible] [illegible]EEL CHANNEL JOISTS ("A")



Revised—See page 8 of addenda.

Code word	Depth in inches	[illegible] ot [illegible]os.	Flange width in inches	Thickness in inches	Length
zefix	8	[illegible].0	2	.072	60'0"
zefoz	8	5.0	2	.120	16'8"*
zefub	7	2.65	1¾	.072	60'0"
zefva	7	4.4	1¾	.120	16'8"*
zefwe	6	2.3	1½	.072	60'0"
zefzo	[illegible]	3.8	1½	.120	16'8"*
zegbo	[illegible]	2.05	1½	.072	60'0"
zegiz	[illegible]	3.4	1½	.120	16'8"*
zegob	4	1.8	1½	.072	60'0"
zeguc	4	3.0	1½	.120	16'8"*

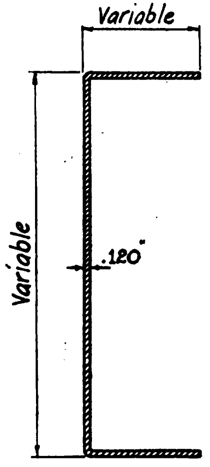
24

* The[illegible]gths can be increased by splicing.

St[illegible] sections .072 thickness may be pronged for lath, heavier sec t[illegible]ay have ⅜ inch holes punched in lower flange for wiring lat[illegible] [illegible]to.

BERLOY METAL LUMBER

SPECIAL PRESSED STEEL CHANNEL JOISTS ("A")



These special channel joists are made ¼ inch oversize when used for headers, and ½ inch oversize when used for trimmers, see pages 96 and 97.

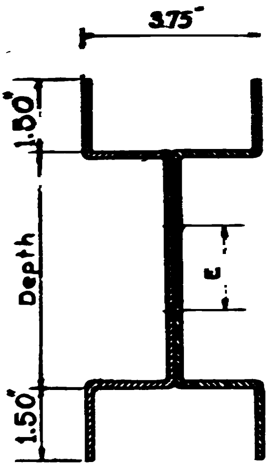
For standard channel joists depth in inches	Weight per foot in lbs.	Approximate flange width in inches	Thickness	Length
12	7.	3	.120	16′8″*
11	6.6	3	.120	16′8″*
10	6.2	3	.120	16′8″*
9	5.6	2¾	.120	16′8″*
8	5.0	2½	.120	16′8″*
7	4.4	2¼	.120	16′8″*
6	3.8	2	.120	16′8″*
5	3.4	2	.120	16′8″*
4	3.0	2	.120	16′8″*

hese lengths can be increased by splicing.

er flanges may have ⅜ inch holes punched for wiring lath thereto esired.

BERLOY METAL LUMBER

SPECIAL PRESSED STEEL LINTELS "A"

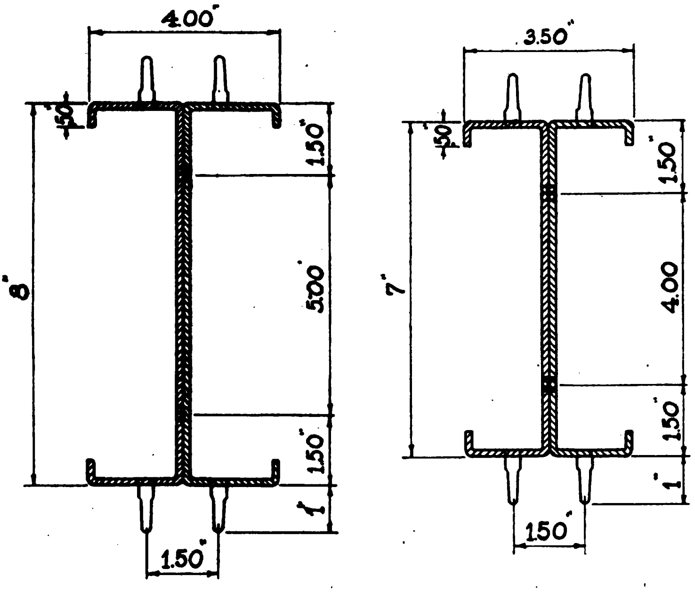


Code word	Depth in inches	Weight per foot in lbs.	Flange thickness in inches	Web thickness in inches	E in inches	Maximum length
zegwa	8	6.84	.072	.144	5	16'8"
zegye	8	11.40	.120	.240	5	16'8"
zehay	7	6.36	.072	.144	4	16'8"
zeheo	7	10.60	.120	.240	4	16'8"
zehez	6	5.88	.072	.144	3½	16'8"
zehib	6	9.80	.120	.240	3½	16'8"
zehux	5	5.40	.072	.144	2½	16'8"
zehud	5	9.00	.120	.240	2½	16'8"
zehyn	4	4.92	.072	.144	1½	16'8
zehze	4	8.20	.120	.240	1½	16'8
zelbt	3	4.44	.072	.144	1½	16'8
zelfy	3	7.40	.120	.240	1½	16'8"

Flanges of sections .072 thickness may be pronged for lath, or heav sections may have ⅜ inch holes punched for wiring lath thereto.

BERLOY METAL LUMBER

STANDARD 8 AND 7 INCH H STUDS ("A")



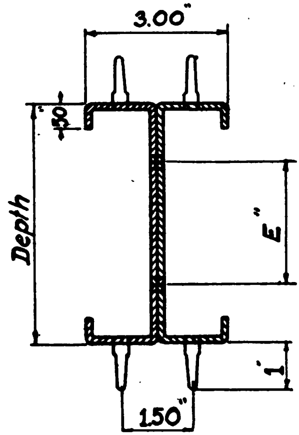
Code word	Depth in inches	Weight per foot in lbs.	Flange width in inches	Flange thickness in inches	Web thickness in inches	Length
d	8	6.0	4	.072	.144	60'0"
f	8	10.0	4	.120	.240	16'8"*
l	7	5.3	3½	.072	.144	60'0"
z	7	8.8	3½	.120	.240	16'8"*

ıese lengths can be increased by splicing.

ıges of sections .072 thickness may be pronged for lath, or heavier ns may have ⅜ inch holes punched for wiring lath thereto.

BERLOY METAL LUMBER

STANDARD 6, 5 AND 4 INCH H STUDS ("A")



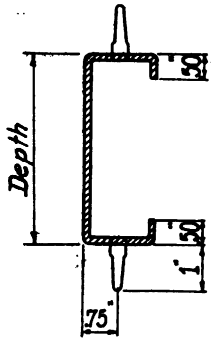
Code word	Depth in inches	Weight per foot in lbs.	Flange width in inches	Flange thickness in inches	Web thickness in inches	E in inches	Length
zejbe	6	4.6	3	.072	.144	3½	60'0"
zejdo	6	7.6	3	.120	.240	3½	16'8"*
zejeb	5	4.1	3	.072	.144	2½	60'0"
zejic	5	6.8	3	.120	.240	2½	16'8"*
zejod	4	3.6	3	.072	.144	1½	60'0"
zejuf	4	6.0	3	.120	.240	1½	16'8"

* These lengths can be increased by splicing.

Flanges of sections .072 thickness may be pronged for lath, or heavi sections may have ⅜ inch holes punched for wiring lath thereto. Spot welds located as shown for I joists of same depths.

BERLOY METAL LUMBER

STANDARD 8, 7, 6, 5 AND 4 INCH CHANNEL STUDS ("A")



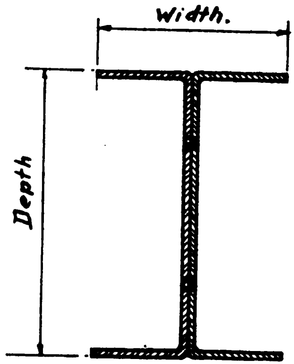
Code word	Depth in inches	Weight per foot in lbs.	Flange width in inches	Thickness in inches	Length
zejyg	8	3.0	2	.072	60′0″
zejza	8	5.0	2	.120	16′8″*
zekab	7	2.65	1¾	.072	60′0″
zekba	7	4.4	1¾	.120	16′8″*
zekce	6	2.3	1½	.072	60′0″
zekec	6	3.8	1½	.120	16′8″*
zekfo	5	2.05	1½	.072	60′0″
id	5	3.4	1½	.120	16′8″*
of	4	1.8	1½	.072	60′0″
ug	4	3.0	1½	.120	16′8″*

ese lengths can be increased by splicing.

ges of sections .072 thickness may be pronged for lath, or heavier ons may have ⅜ inch holes punched for wiring lath thereto.

BERLOY METAL LUMBER

SPECIAL 8, 7, 6, 5 AND 4 INCH
H STUDS ("A")

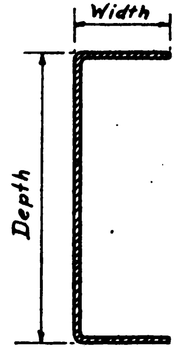


Depth in inches	Weight per foot in lbs.	Flange width in inches	Flange thickness in inches	Web thickness in inches	Length
8	6.0	5	.072	.144	16'8"*
8	10.0	5	.120	.240	16'8"*
7	5.3	4½	.072	.144	16'8"*
7	8.8	4½	.120	.240	16'8"*
6	4.6	4	.072	.144	16'8"*
6	7.6	4	.120	.240	16'8"*
5	4.1	4	.072	.144	16'8"*
5	6.8	4	.120	.240	16'8"
4	3.6	4	.072	.144	16'8"
4	6.0	4	.120	.240	16'8"

* These lengths can be increased by splicing.

Flanges of sections .072 thickness may be pronged for lath or heav sections may have ⅜ inch holes punched for wiring lath thereto.

BERLOY METAL LUMBER

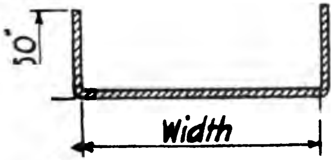


SPECIAL 8, 7, 6, 5 AND 4 INCH CHANNEL STUDS ("A") AND SPECIAL "A" CHANNEL TRACK

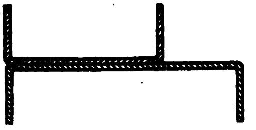
Depth in inches	Weight per foot in lbs.	Flange width in inches	Flange thickness in inches	Length
8	3.0	2½	.072	16′8″*
8	5.0	2½	.120	16′8″*
7	2.65	2¼	.072	16′8″*
7	4.4	2¼	.120	16′8″*
6	2.3	2	.072	16′8″*
6	3.8	2	.120	16′8″*
5	2.05	2	.072	16′8″*
5	3.4	2	.120	16′8″*
4	1.8	2	.072	16′8″*
4	3.0	2	.120	16′8″*

* These lengths can be increased by splicing.

Flanges of sections .072 thickness may be pronged for lath, or heavier sections may have ⅜ inch holes punched for wiring lath thereto.



Special Channel Track



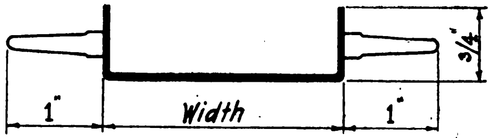
Special Double Track

der on basis of size of studs used in partition.

tails of sizes and weights of "A" track on page 41.

BERLOY METAL LUMBER

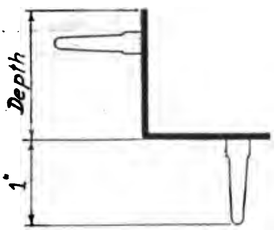
"B" SECTIONS



Channel Studs "B"

Sizes and weights listed on page 49.

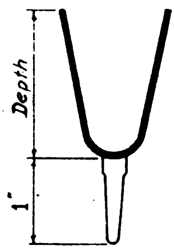
Track details given on following page.



Standard Angle Stud "B"

Sizes and weights listed on page 50.

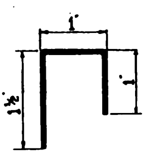
Use same track as for U studs.



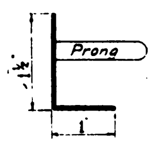
Standard U-Stud "B"

Sizes and weights listed on page 50.

Track details given on following page.



Standard (Ceiling) Channel "B" Track for ¾" Rib-plex Partitions

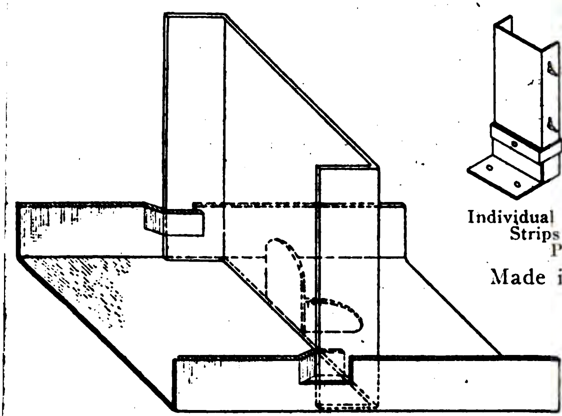


Standard (Floor) Angle "B" Track for ¾" Rib-plex Partitions

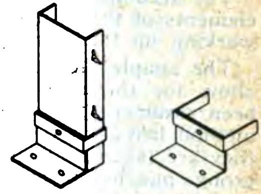
Details and weights listed on page 49.

BERLOY METAL LUMBER

"B" SECTIONS

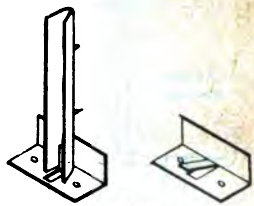


Standard Channel Socket Strip "B"



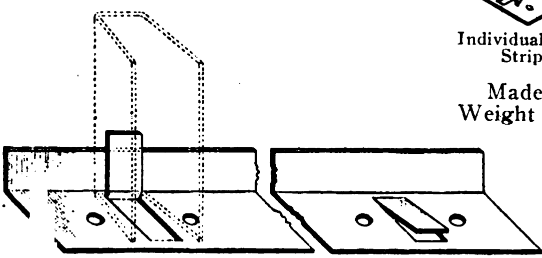
Individual Channel Socket
Strips for Curved
Partitions

Made in 18 gauge.



Individual U-Stud Socket
Strips for Curved
Partitions

Made in 18 gauge.
Weight 100 lbs. per M.



Standard U-Stud Socket Strip "B"

-s and weights listed on page 50.

BERLOY METAL LUMBER

DETAILS OF CALCULATION OF SECTIONS

The accompanying figures Nos. 1 and 2 and the calculation of elements of the 4 inch .072 thickness joist shows the method of working up the data published in this hand book.

The simple elementary figures (in the form of trapezoids to allow for the rounded corners) used in the calculation have been assumed as rectangles, based on their average lengths, this method being on the safe side and simpler to calculate than if they are taken as trapezoids. One ⅜ inch hole is deducted for prongs punched from lower flanges, these prongs being staggered.

For calculations, the strips for each channel are figured ½ inch narrower than the outside dimension of the channel, on account of rounded corners.

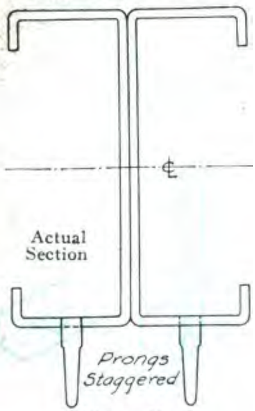


Figure No. 1

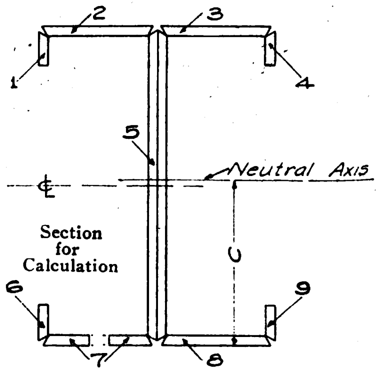


Figure No. 2

Notation or symbols.

b = width of any simple elementary figure.
h = depth of any simple elementary figure.
A = area of any simple elementary figure.
d = distance from base line to center of gravity of any elementary figure.
I = moment of inertia.
c = distance between center of gravity of any elementary figure from the neutral axis of the total section.
C = distance from extreme fibre to neutral axis.

BERLOY METAL LUMBER

COMPUTATION OF SECTION MODULUS AND MOMENT OF INERTIA OF 4", .072" THICKNESS I JOIST

Area of 1 = bh	=	.072	×	.4375	=	.0315	Ad of 1	=	.0315	×	3.7188	=	.11715
Area of 2 = bh	=	1.375	×	.072	=	.099	Ad of 2	=	.099	×	3.964	=	.39243
Area of 3 = bh	=	1.375	×	.072	=	.099	Ad of 3	=	.099	×	3.964	=	.39243
Area of 4 = bh	=	.072	×	.4375	=	.0315	Ad of 4	=	.0315	×	3.7188	=	.11715
Area of 5 = bh	=	.144	×	3.875	=	.5580	Ad of 5	=	.5580	×	2.	=	1.116
Area of 6 = bh	=	.072	×	.4375	=	.0315	Ad of 6	=	.0315	×	.2812	=	.00886
Area of 7 = bh	=	1.000	×	.072	=	.072	Ad of 7	=	.072	×	.036	=	.00259
Area of 8 = bh	=	1.375	×	.072	=	.099	Ad of 8	=	.099	×	.036	=	.00356
Area of 9 = bh	=	.072	×	.4375	=	.0315	Ad of 9	=	.0315	×	.2812	=	.00886
				Sum of net areas	=	1.0530					Sum	=	2.15903

$$\text{Distance of neutral axis above base} = \frac{A_1d_1 + A_2d_2 + A_3d_3 \ldots\ldots\ldots A_9d_9}{A_1 + A_2 + A_3 \ldots\ldots\ldots A_9} = 2.159 \div 1.053 = 2.0504$$

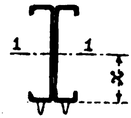
I of 1	= $1/12\ bh^3 + A\ c^2$	= 1/12	×	.072	×	$.4375^3$	+	.0315	×	1.6684^2	= .088182
I of 2	= $1/12\ bh^3 + A\ c^2$	= 1/12	×	1.375	×	$.0720^3$	+	.099	×	1.9136^2	= .362568
I of 3	= $1/12\ bh^3 + A\ c^2$	= 1/12	×	1.375	×	$.0720^3$	+	.099	×	1.9136^2	= .362568
I of 4	= $1/12\ bh^3 + A\ c^2$	= 1/12	×	.072	×	$.4375^3$	+	.0315	×	1.6684^2	= .088182
I of 5	= $1/12\ bh^3 + A\ c^2$	= 1/12	×	.144	×	3.8750^3	+	.5580	×	$.0504^2$	= .699647
I of 6	= $1/12\ bh^3 + A\ c^2$	= 1/12	×	.072	×	$.4375^3$	+	.0315	×	1.7692^2	= .099098
I of 7	= $1/12\ bh^3 + A\ c^2$	= 1/12	×	1.000	×	$.0720^3$	+	.072	×	2.0144^2	= .292193
I of 8	= $1/12\ bh^3 + A\ c^2$	= 1/12	×	1.375	×	$.0720^3$	+	.099	×	2.0144^2	= .401757
I of 9	= $1/12\ bh^3 + A\ c^2$	= 1/12	×	.072	×	$.4375^3$	+	.0315	×	1.7692^2	= .099098

Total Moment of Inertia = 2.493293

Section Modulus = I/C = 2.493293 ÷ 2.0504 = 1.216

BERLOY METAL LUMBER

ELEMENTS OF STANDARD I JOISTS



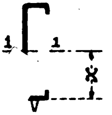
36 Revised—See page 9 of addenda.

Code word	Depth in inches	Weight per foot in lbs.	Net area of section in inches	Flange width in inches	Web thickness in inches	AXIS 1-1			
						I	r	[illegible]	x
zedta	4	3.6	1.0530	3.00	.144	2.4933	1.539[illegible]	[illegible]0	2.05040
zeduz	4	6.0	1.7550	3.00	.240	4.0985	1.[illegible]	[illegible]9995	2.04970
zedev	5	4.1	1.1970	3.00	.144	4.2495	[illegible]	1.6628	2.55550
zedoy	5	6.8	1.9950	3.00	.240	7.01[illegible]	[illegible]46	2.7438	2.55500
zeczy	6	4.6	1.3410	3.00	.144	6[illegible]	[illegible].2191	2.1584	3.05960
zedat	6	7.6	2.2350	3.00	.240	[illegible]	2.2104	3.5696	3.05920
zecux	7	5.3	1.5570	3.50	.1[illegible]	[illegible]31	2.5960	2.9474	3.56010
zecwo	7	8.8	2.5950	3.50	[illegible]	[illegible].3671	2.5870	4.8788	3.55970
zecsa	8	6.0	1.7730	4.00	[illegible]	15.6596	2.9720	3.8567	4.06040
zecte	8	10.0	2.9550	4[illegible]	[illegible]40	25.9381	2.9626	6.3886	4.06000
zecas	9	8.3	2.4586	[illegible]	.178	27.0602	3.3176	5.9336	4.56048
zecet	9	6.7	1.989[illegible]	[illegible]	.144	21.9302	3.3205	4.8086	4.56060
zeciv	9	11.2	3.3[illegible]	[illegible].00	.240	36.3684	3.3122	7.9751	4.56027
zebse	10	9.5	[illegible]	4.50	.184	38.4498	3.6941	7.5979	5.06059
zebvo	10	7.4[illegible]	[illegible]0	4.50	.144	30.1489	3.6977	5.9574	5.06078
zebyx	10	12[illegible]	[illegible]6750	4.50	.240	50.0174	3.6892	9.8839	5.06049
zebar	11	[illegible]	3.5561	4.50	.218	57.4029	4.0177	10.3194	5.56260
zebit	11	[illegible]	2.3490	4.50	.144	38.0352	4.0239	6.8374	5.56280
zebov	1[illegible]	[illegible]3.2	3.9150	4.50	.240	63.1377	4.0159	11.3505	5.56253
zeask	[illegible]	12.7	3.7741	4.50	.218	71.1033	4.3405	11.7248	6.[illegible]37
zeatl	[illegible]	8.4	2.4930	4.50	.144	47.0958	4.3464	7.7657	6.[illegible]59
ze[illegible]	[illegible]2	14.0	4.1550	4.50	.240	78.2154	4.3387	12.8973	6.[illegible]33

[illegible]Moment of Inertia r=Radius of Gyration S=Section Mod[illegible]us

BERLOY METAL LUMBER

ELEMENTS OF STANDARD CHANNEL JOISTS



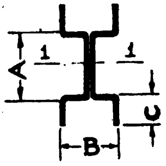
Code word	Depth in inches	Weight per foot in lbs.	Net area of section in inches	Flange width in inches	Web thickness in inches	1-1			
						I	[illegible]	S	x
zegob	4	1.80	.513	1.50	.072	1.19[illegible]	.5233	.5659	2.1034
zeguc	4	3.00	.855	1.50	.120	1.[illegible]	1.5123	.9305	2.1022
zegbo	5	2.05	.585	1.50	.072	[illegible]	1.8694	.7822	2.6138
zegiz	5	3.40	.975	1.50	.120	[illegible]619	1.8568	1.2868	2.6126
zefwe	6	2.30	.657	1.50	.0[illegible]	[illegible].1751	2.1983	1.0171	3.1218
zefzo	6	3.80	1.095	1.50	[illegible]	5.2533	2.1904	1.6833	3.1208
zefub	7	2.65	.765	1.75	[illegible]	5.0759	2.5758	1.4013	3.6222
zefva	7	4.40	1.275	1.7[illegible]	[illegible]120	8.4085	2.5673	2.3205	3.6214
zefix	8	3.00	.873	2[illegible]	.072	7.6078	2.9524	1.8454	4.1225
zefoz	8	5.00	1.455	[illegible]	.120	12.5127	2.9419	3.0551	4.1218
zeerk	9	4.15	1.2126	[illegible]0	.089	13.1807	3.2969	2.8513	4.6226
zeewp	9	3.35	.98[illegible]	[illegible].00	.072	10.6847	3.3002	2.3113	4.6229
zefav	9	5.60	1.[illegible]	2.00	.120	17.7222	3.2923	3.8341	4.6222
zeemf	10	4.75	[illegible]	2.25	.092	18.7857	3.6743	3.6670	5.1228
zeeng	10	3.70	[illegible]9	2.25	.072	14.7294	3.6777	2.8751	5.1231
zeeph	10	6.7[illegible]	[illegible].815	2.25	.120	24.4390	3.6695	4.7709	5.1225
zeect	11	[illegible]	1.7576	2.25	.109	28.0741	3.9966	4.9895	5.6266
zeegy	11	[illegible]	1.161	2.25	.072	18.6004	4.0026	3.3055	5.6271
zeeld	11	[illegible]60	1.935	2.25	.120	30.8796	3.9948	5.4882	5.6265
ze[illegible]	12	[illegible]6.35	1.8666	2.25	.109	34.8054	4.3181	5.6777	6.1302
ze[illegible]	[illegible]	4.20	1.233	2.25	.072	23.0519	4.3238	3.7601	6.1306
ze[illegible]	[illegible]	7.00	2.055	2.25	.120	38.2876	4.3164	6.2458	6.1301

Revised—See page 10 of addenda.

37

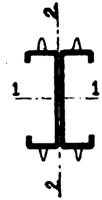
BERLOY METAL LUMBER

ELEMENTS OF LINTELS



Code word	Depth A in inches	Weight per foot in lbs.	Net area of section in inches	Flange width B in inches	Track depth C in inches	Web thickness in inches	AXIS 1-1 I	AXIS 1-1 r	AXIS 1-1 S
zeibt	3	4.44	1.33	3.75	1.50	.144	3.085	1.574	1.028
zeify	3	7.40	2.22	3.75	1.50	.240	5.145	1.566	1.715
zehya	4	4.92	1.47	3.75	1.50	.144	5.180	1.931	1.480
zehze	4	8.20	2.46	3.75	1.50	.240	8.651	1.924	2.472
zehoc	5	5.40	1.62	3.75	1.50	.144	7.969	2.280	1.992
zehud	5	9.00	2.70	3.75	1.50	.240	13.325	2.273	3.331
zehez	6	5.88	1.76	3.75	1.50	.144	11.524	2.622	2.561
zehib	6	9.80	2.94	3.75	1.50	.240	19.288	2.616	4.286
zehay	7	6.36	1.91	3.75	1.50	.144	15.913	2.956	3.183
zehco	7	10.60	3.18	3.75	1.50	.240	26.660	2.953	5.332
zegwa	8	6.84	2.05	3.75	1.50	.144	21.214	3.286	3.857
zegye	8	11.40	3.42	3.75	1.50	.240	35.561	3.284	6.466

BERLOY METAL LUMBER

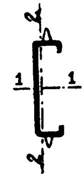


ELEMENTS OF STANDARD "H" STUDS

Code word	Depth in inches	Weight per ft. in lbs.	Net area of sect. in ins.	Flange width in ins.	Web thickness in ins.	AXIS 1-1			AXIS 2-2		
						I	r	S	I	r	S
zejod	4	3.60	.972	3.00	.144	2.1834	1.4988	1.0918	.4942	.7130	.3294
zejuf	4	6.00	1.620	3.00	.240	3.5946	1.4896	1.7972	.8120	.7080	.5414
zejeb	5	4.10	1.116	3.00	.144	3.7613	1.8358	1.5045	.4945	.6656	.3296
zejic	5	6.80	1.860	3.00	.240	6.2128	1.8276	2.4851	.8130	.6611	.5420
zejbe	6	4.60	1.260	3.00	.144	5.9162	2.1669	1.9721	.4947	.6266	.3298
zejdo	6	7.60	2.100	3.00	.240	9.7961	2.1598	3.2654	.8143	.6227	.5429
zeirl	7	5.30	1.476	3.50	.144	9.5268	2.5406	2.7219	.7714	.7229	.4408
zejaz	7	8.80	2.460	3.50	.240	15.7791	2.5326	4.4056	1.2734	.7195	.7278
zeikd	8	6.00	1.692	4.00	.144	14.3932	2.9166	3.5984	1.1244	.8152	.5622
zeilf	8	10.00	2.820	4.00	.240	23.8528	2.9083	5.9632	1.8600	.8121	.9300

BERLOY METAL LUMBER

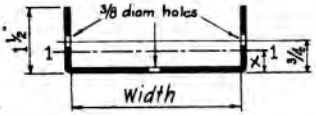
ELEMENTS OF STANDARD CHANNEL STUDS



Code word	Depth in inches	Weight per ft. in lbs.	Net area of sect. in ins.	Flange width in ins.	Web thickness in ins.	AXIS 1-1			AXIS 2-2			
						I	r	S	I	r	S	x
zekof	4	1.80	.486	1.50	.072	1.0917	1.4988	.5459	.1561	.5668	.1472	.4327
zekug	4	3.00	.810	1.50	.120	1.7973	1.4896	.8986	.2468	.5520	.2336	.4433
zekfo	5	2.05	.558	1.50	.072	1.8806	1.8358	.7522	.1660	.5455	.1484	.3815
zekid	5	3.40	.930	1.50	.120	3.1064	1.8276	1.2425	.2623	.5311	.2372	.3939
zekce	6	2.30	.630	1.50	.072	2.9581	2.1669	.9861	.1737	.5250	.1500	.3420
zekec	6	3.80	1.050	1.50	.120	4.8980	2.1598	1.6327	.2743	.5111	.2397	.3557
zekab	7	2.65	.738	1.75	.072	4.7634	2.5406	1.3610	.2717	.6068	.2002	.3930
zekba	7	4.40	1.230	1.75	.120	7.8895	2.5326	2.2028	.4329	.5933	.3224	.4071
zejyg	8	3.00	.846	2.00	.072	7.1966	2.9166	1.7992	.3972	.6852	.2549	.4417
zejza	8	5.00	1.410	2.00	.120	11.9264	2.9083	2.9816	.6369	.6721	.4125	.4560

BERLOY METAL LUMBER

ELEMENTS OF CHANNEL TRACK "A"



Code word	Width in inches	Thick-ness in inches	Weight per foot in lbs.	Net area of sec-tion in inches	AXIS 1-1			
					I	r	S	x
zelog	4	.072	1.62	.4154	.09033	.4663	.0762	.3146
zeluh	4	.120	2.70	.7038	.14600	.4555	.1243	.3253
zelif	5	.072	1.86	.4874	.09512	.4418	.0776	.2734
zeljy	5	.120	3.10	.8238	.15334	.4314	.1264	.2867
zeled	6	.072	2.10	.5594	.09871	.4201	.0785	.2429
zelgo	6	.120	3.50	.9438	.15884	.4102	.1279	.2578
zelca	7	.072	2.34	.6314	.10147	.4009	.0792	.2193
zelde	7	.120	3.90	1.0638	.16315	.3916	.1290	.2355
zekyh	8	.072	2.58	.7034	.10364	.3839	.0798	.2005
zelac	8	.120	4.30	1.1838	.16660	.3751	.1299	.2177

Made oversize to receive H or Channel Studs.

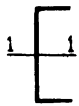
SHEARING VALUE OF FLANGES

·ickness of Metal in inches	Area of Flanges in square inches	Total Shearing Strength @ 10,000 Lbs. per square inch
.072	.207	2070 Pounds
.120	.345	3450 Pounds

BERLOY METAL LUMBER

ELEMENTS OF BERLOY CHANNELS "C"

For designing suspended ceilings carrying light loads and for non-supporting partitions.



Code word	Size in inches		Gauge	Area in inches	Weight per foot in lbs.	I 1-1	S 1-1
	Depth	Flange					
zerja	¾	⅜	16	.078	.276	.00594	**.0158**
zerke	⅞	⅜	16	.086	.304	.00869	**.0198**
zeron	1	⅜	16	.094	.332	.01212	**.0242**
zerpy	1¼	⅜	16	.109	.387	.02124	**.0399**
zeryp	1½	⅜	16	.125	.456	.03377	**.0450**
zeska	2	⅜	16	.156	.580	.07104	**.0710**
zesak	1½	½	16	.141	.539	.04186	**.0558**
zesel	1⅞	½	18	.131	.458	.05880	**.0627**
zesle	2	½	16	.172	.635	.08573	**.0857**

BERLOY METAL LUMBER

DIMENSIONS AND PROPERTIES OF SECTIONS

The following tables give the dimensions and weights of structural sections formed of Berloy Pressed Steel. They also give the section modulus of joists and lintels, and the radius of gyration of studs. Proper allowance is made for prongs in all cases.

The sizes and weights listed are for standard stock sections, or are indicated as special sections which carry an extra charge as noted in the differentials.

I joists, channel joists, lintels, H-studs and channel studs are also furnished oversize for trimmers, headers, etc., as shown in drawings on pages 96 and 97. The width of flanges being wider than dimensions "B" as they include in the flat flange, the metal on either or both sides indicated by dimension "C". The section modulus for all practical purposes may be assumed the same as listed above for the same depth and weight of section.

Quotations will be made on request for special weight or shape sections.

All pressed steel structural or load carrying members are noted as "A" sections, and are of not less than .072 inches thickness.

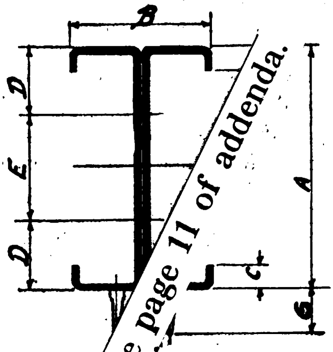
The sections noted as "B" material are of 18 or 20 gauge, and are designed for non-supporting partitions, ceilings, etc.

Flanges of sections .072 inch, .089 inch and .092 inch thickness may be pronged for lath, or heavier sections may have ⅜-inch holes punched for wiring lath thereto.

Special oversize joists or other members, such as headers to receive tail joists, should be ¼ inch over size; and as trimmers to receive headers, should be ½ inch over standard size.

BERLOY METAL LUMB

DIMENSIONS AND PROPERT OF STANDARD PRESSED STEEL ⁄ISTS



44 Revised—See page 11 of addenda.

Code word	Web thickness in inches	Weight per foot in lbs.	[illegible]	1-1 Sect. Mod.	A	B	C	D	E	F	G
zedta	.144	3.6	[illegible]	1.2160	4	3	½	1¼	1½	¾	1
zeduz	.240	6.0	3"*	1.9995							
zedev	.144	4.1	0"	1.6628	5	3	½	1¼	2½	¾	1
zedoy	.240	6.	'8"*	2.7438							
zeczy	.144	4	60'0"	2.1584	6	3	½	1¼	3½	¾	1
zedat	.240	[illegible]	16'8"*	3.5696							
zecux	.144	[illegible]	60'0"	2.9474	7	3½	½	1½	4	¾	1
zecwo	.240	[illegible]	16'8"*	4.8788							
zecsa	.144	[illegible]	60'0"	3.8567	8	4	½	1½	5	¾	1
zecte	.240	0	16'8"*	6.3886							
zecas	.178	.3	60'0"	5.9336	9	4	¾	2	5	¾	1
zecet	.144	5.7	16'8"*	4.8086							
zeciv	.24	1.2	16'8"*	7.9751							
zebse	.1	9.5	60'0"	7.5979	10	4½	¾	2	6	¾	1
zebvo	.	7.4	16'8"*	5.9574							
zebyx	[illegible]	12.4	16'8"*	9.8839							
zebar	[illegible]	12.0	60'0"	10.3194	11	4½	¾	2½	6	¾	1
zebit	[illegible]	7.9	16'8"*	6.8374							
zebov	[illegible]	13.2	12'6"*	11.3505							
zeask	18	12.7	60'0"	11.7248	12	4½	¾	2½	7	¾	1
zeatl	44	8.4	16'8"*	7.7657							
zeawn	.240	14.0	12'6"*	12.8973							

*These s can be increased by splicing.

The .178 and .184 thickness pronged for lath; the .240 thickness has ⅜ ich holes ed in lower flange for wiring lath.

For I joist sections see page 21.

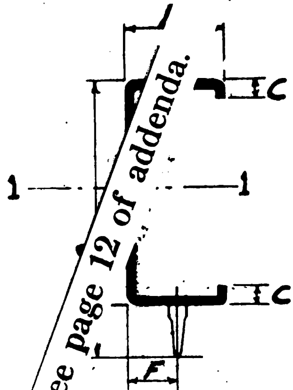
Se odulus figured with one prong out as prongs on bottom flange are staggere

S hod of calculation on pages 34 and 35.

BERLOY META[illegible] JMBER
DIMENSIONS AND P[illegible] ERTIES OF
STANDARD PRESSED ST[illegible] CHANNEL JOISTS

Revised—See page 12 of addenda.

45

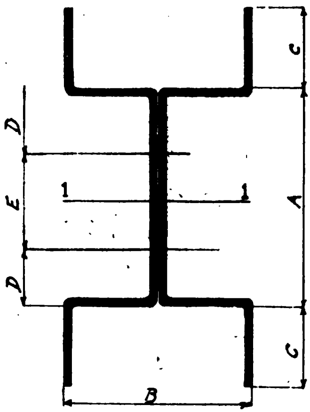


Code word	Web thickness in inches	W[illegible] p[illegible]t [illegible].	Max. length	1–1 Sect. Mod.	A	B	C	F	G
zegob	.072	[illegible]0	60′ 0″	.5660	4	1½	½	¾	1
zeguc	.120	[illegible]00	16′ 8″*	.9305					
zegbo	.072	[illegible].05	60′ 0″	.7822	5	1½	½	¾	1
zegiz	.120	[illegible].40	16′8″*	1.2863					
zefwe	.07[illegible]	2.30	60′ 0″	1.0171	6	1½	½	¾	1
zefzo	.12[illegible]	3.80	16′ 8″*	1.6833					
zefub	.0[illegible]	2.65	60′ 0″	1.4013	7	1¾	½	¾	1
zefva	[illegible]	4.40	16′ 8″*	2.3205					
zefix	[illegible]	3.00	60′ 0″	1.8454	8	2	½	¾	1
zefoz	[illegible]	5.00	16′ 8″*	3.0551					
zeerk	[illegible]	4.15	60′ 0″	2.8513	9	2	¾	¾	1
zeewp	[illegible]	3.35	16′ 8″*	2.3113					
zefav	[illegible]0	5.60	16′ 8″*	3.8341					
zeemf	[illegible]92	4.75	60′ 0″	3.6670	10	2¼	¾	¾	1
zeeng	[illegible]72	3.70	16′ 8″*	2.8751					
zeeph	[illegible]120	6.20	16′ 8″*	4.7709					
[illegible]t	.109	6.00	60′ 0″	4.9895	11	2¼	¾	¾	1
[illegible]gy	.072	3.95	16′ 8″*	3.3055					
[illegible]id	.120	6.60	12′ 6″*	5.4882					
[illegible]lv	.109	6.35	60′ 0″	5.6777	12	2¼	¾	¾	1
[illegible]ly	.072	4.20	16′ 8″*	3.7601					
[illegible]	.120	7.00	12′ 6″*	6.2458					

* [illegible]ngths can be increased by splicing.
T[illegible] .089 and .092 thickness pronged for lath, the .120 thickness has ⅜ inch h[illegible]ched in lower flange for wiring lath.
F[illegible]al channel joist sections see page 25.
S[illegible] modulus figured with prong out.

BERLOY METAL LUMBER

DIMENSIONS AND PROPERTIES OF PRESSED STEEL LINTELS

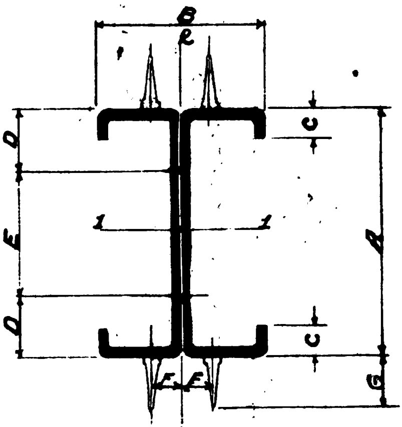


Code word	Web thickness in inches	Weight per foot in lbs.	1-1 Sect. Mod.	Dimensions in inches				
				A	B	C	D	E
zeibt	.144	4.44	1.028	3	3¾	1½	¾	1½
zeify	.240	7.40	1.715					
zehya	.144	4.92	1.480	4	3¾	1½	1¼	1½
zehze	.240	8.20	2.472					
zehoc	.144	5.40	1.992	5	3¾	1½	1¼	2½
zehud	.240	9.00	3.331					
zehez	.144	5.88	2.561	6	3¾	1½	1¼	3½
zehib	.240	9.80	4.286					
zehay	.144	6.36	3.183	7	3¾	1½	1½	4
zehco	.240	10.60	5.332					
zegwa	.144	6.84	3.857	8	3¾	1½	1½	5
zegye	.240	11.40	6.466					

Maximum Lengths 16′ 8″.

BERLOY METAL LUMBER

DIMENSIONS AND PROPERTIES OF STANDARD PRESSED STEEL H-STUDS



Code word	Web thickness in inches	Weight per foot in lbs.	1–1 r	2–2 r	Dimensions in inches						
					A	B	C	D	E	F	G
zejod zejuf	.144 .240	3.60 6.00	1.499 1.489	.713 .708	4	3	½	1¼	1½	¾	1
zejeb zejic	.144 .240	4.10 6.80	1.836 1.827	.665 .661	5	3	½	1¼	2½	¾	1
zejbe zejdo	.144 .240	4.60 7.60	2.1669 2.1598	.6266 .6227	6	3	½	1¼	3½	¾	1
zeirl zejaz	.144 .240	5.30 8.80	2.540 2.532	.723 .719	7	3½	½	1½	4	¾	1
z[illegible]l z[illegible]	.144 .240	6.00 10.00	2.916 2.908	.815 .812	8	4	½	1½	5	¾	1

M[illegible] mum lengths 16′ 8″.

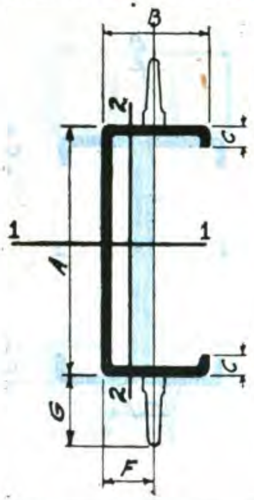
Th[illegible] .144 thickness may be pronged for lath, the .240 thickness may have ⅜ inch ho[illegible] punched in flanges for wiring lath.

Fo[illegible] pecial H Stud sections, see page 30.

r= [illegible]dius of Gyration.

BERLOY METAL LUMBER

DIMENSIONS AND PROPERTIES OF STANDARD PRESSED STEEL CHANNEL STUDS



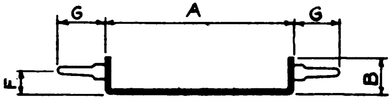
Code word	Web thickness in inches	Weight per foot in lbs.	1–1 r	2–2 r	Dimensions in inches A	B	C	F	G
zekof zekug	.072 .120	1.80 3.00	1.499 1.490	.567 .552	4	1½	½	¾	1
zekfo zekid	.072 .120	2.05 3.40	1.836 1.828	.546 .531	5	1½	½	¾	1
zekce zekec	.072 .120	2.30 3.80	2.167 2.160	.525 .511	6	1½	½	¾	1
zekab zekba	.072 .120	2.65 4.40	2.541 2.533	.607 .593	7	1¾	½	¾	1
zejyg zejza	.072 .120	3.00 5.00	2.917 2.908	.685 .672	8	2	½	¾	1

Maximum lengths 16′ 8″.

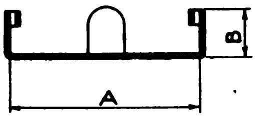
The .072 thickness may be pronged for lath, the .120 thickness may have ⅜ inch holes punched in flanges for wiring lath.

For special Channel Stud sections, see page 31.

BERLOY METAL LUMBER
DIMENSIONS AND WEIGHTS OF PRESSED STEEL B CHANNEL STUDS AND SOCKET STRIPS

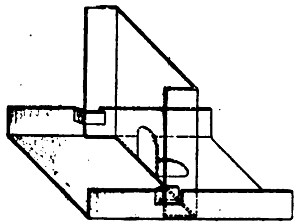


Channel Stud "B"



Socket Strip "B"

Standard punching 13½" on centers. Can be punched for any desired spacing.


Isometric of Strip with Stud in Place

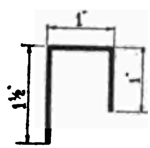
CHANNEL STUDS "B"

Code word	Wt.	Ga.	A	B	F	G
zelyj	.58	18	2	¾	½	1
zemad	.44	20				
zemda	.67	18	2½	¾	½	1
zemef	.50	20				
zemfe	.75	18	3	¾	½	1
zemho	.56	20				
zemig	.84	18	3½	¾	½	1
zemky	.62	20				
zemoh	.92	18	4	¾	½	1
zemuj	.69	20				

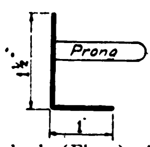
SOCKET STRIPS "B"

Code word	Wt.	Ga.	A	B
zemyk	.67	18	2	1
zenaf	.50	20		
zeneg	.75	18	2½	1
zenfa	.56	20		
zenge	.84	18	3	1
zenjo	.62	20		
zenoj	.92	18	3½	1
zenuk	.69	20		
zenyl	1.00	18	4	1
zeody	.75	20		

Lengths over 12′ 0″ long require splices.



..dard (Ceiling) Channel Track for ¾" Ribplex Partitions, Weight, 0.59 lbs.

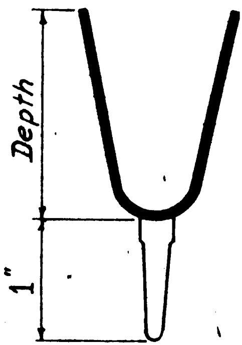


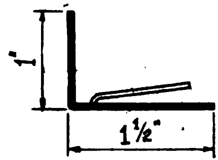
Standard (Floor) Angle Track for ¾" Ribplex Partitions, Weight, 0.42 lbs.

ll dimensions are given in inches.
weights are given in pounds per foot.

BERLOY METAL LUMBER

DIMENSIONS AND WEIGHTS OF PRESSED STEEL U AND ANGLE STUDS AND SOCKET STRIPS, "B" MATERIAL





SOCKET STRIPS "B" FOR U-STUDS

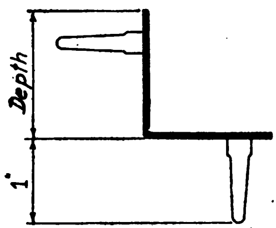
Furnished in 10-foot lengths unless otherwise specified.

Code word	Size, Ins.	Gauge	Weight per Ft. Black	Weight per Ft. Galv.
zepmy	1x1½	20	.31	.35
zepok	1x1½	18	.42	.45

U-STUDS "B"

Also used for Ceiling and Wall Furring. Furnished in 10-foot lengths unless otherwise specified. Lengths over 12 feet, require splices.

Code word	Size Ins.	Ga.	Weight per Ft. Black	Weight per Ft. Galv.
zeojd	¾	20	.25	.28
zeolg	1	20	.31	.35
zeonj	1¼	20	.38	.41
zeopk	1½	20	.44	.48
zeorm	1¾	20	.50	.55
zeowr	2	20	.56	.62
zeozt	¾	18	.33	.36
zepag	1	18	.42	.45
zepga	1¼	18	.50	.54
zephe	1½	18	.58	.63
zepij	1¾	18	.67	.72
zepko	2	18	.75	.81



ANGLE STUDS "B" FOR OUTSIDE CORNERS

Lengths over 12 feet require splices.

Code word	Size, Ins.	Gauge	Weight per Ft. Black	Weight per Ft. Galv.
zepul	1¼x1¼	20	.31	
zeraj	1½x1½	20	.38	
zerek	1¼x1¼	18	.42	
zeril	1½x1½	18	.50	

Socket strips can be furnished plain or punched to any e- sired uniform spacing.

Individual socket strips described on page 33.

BERLOY METAL LUMBER

"C" COLD ROLLED CHANNELS MADE WITHOUT PRONGS

Code word	Size in inches	Flange width in inches	Gauge	Weight per 1000 lineal feet
zerja	¾	⅜	16	276
zerke	⅞	⅜	16	304
zeron	1	⅜	16	332
zerpy	1¼	⅜	16	387
zeryp	1½	⅜	16	456
zesak	1½	½	16	539
zesel	1⅞	½	18	458
zeska	2	⅜	16	580
zesle	2	½	16	635

For partitions, suspended ceilings, furring, formed work—all places where non-bearing supports are required, Berloy Cold Rolled Channels should be used. The smaller sizes can readily be bent on the job for formed work. Wire Ribplex or Berloy Diamond Mesh Lath to these channels and you have a permanent fire-proof partition or ceiling.

lements of sections, page 42.

spended ceiling details, **pages 118 and 119.**

artition details, page 125.

tock lengths 12′, 14′, 16′, 18′ and 20′. Sizes up to and including 1 ch are packed 20 pieces to a bundle; sizes above 1 inch are packed 1 ces to the bundle.

BERLOY METAL LUMBER

SAFE LOAD TABLES

Total Safe Load tables for Berloy pressed steel structural sections are given as follows:

Page 56 Graph, Loads 9 to 19 feet, spacings 12 and 15¾ inches, also average weights of steel.
Page 57 Graph, Loads 9 to 19 feet, spacings 19 and 23½ inches, also average weights of steel.
Page 58 Graph, Loads 9 to 19 feet, spacings 12 and 15¾ inches, also average weights of steel.
Page 59 Graph, Loads 19 to 29 feet, spacings 19 and 23½ inches, also average weights of steel.

Pages 60-61. Total safe uniform loads in pounds for Berloy Pressed Steel I-Joists. Based on fibre stress of 16,000 lbs. per square inch. Loads below heavy lines produce deflection greater than 1/360 of span.

Pages 62-63. Total safe uniform loads in pounds for Berloy Pressed Steel I-Joists. Maximum fibre stress of 16,000 lbs. per square inch. No tabulated load will produce deflection greater than 1/360 of span.

Pages 64-65. Total safe uniform loads per square foot for Berloy Pressed Steel I-Joists.

Spaced at 23½ Inches on Centers

Maximum fibre stress 16,000 lbs. per square inch. No tabulated load will produce deflection greater than 1/360 of span.

Pages 66-67. Total safe uniform loads per square foot for Berloy Pressed Steel I-Joists.

Spaced at 19 Inches on Centers

Maximum fibre stress 16,000 lbs. per square inch. No tabulated load will produce deflection greater than 1/360 of spa

Pages 68-69. Total safe uniform loads per square foot for Berloy Pressed Steel I-Joists.

Spaced at 15¾ Inches on Centers

Maximum fibre stress 16,000 lbs. per square inch. No bulated load will produce deflection greater than 1/360 of spa

BERLOY METAL LUMBER

Pages 70-71. Total safe uniform loads per square foot for Berloy Pressed Steel I-Joists.

Spaced at 12 Inches on Centers

Maximum fibre stress 16,000 lbs. per square inch. No tabulated load will produce deflection greater than 1/360 of span.

Pages 72-73. Total safe uniform loads in pounds for Berloy Pressed Steel Channel Joists. Maximum fibre stress of 16,000 lbs. per square inch. Loads below heavy lines will produce deflection greater than 1/360 of span.

Pages 74-75. Total safe uniform loads in pounds for Berloy Pressed Steel Channel Joists. Maximum fibre stress of 16,000 lbs. per square inch. No tabulated load will produce deflection greater than 1/360 of span.

Page 76. Total safe load in pounds per stud for Berloy Pressed Steel H-Studs in supporting partitions.

Page 77. Total safe load in pounds per stud for Berloy Pressed Steel H-Studs about the least radius of gyration where to be used as columns.

Page 78. Total safe load in pounds per stud for Berloy Pressed Steel Channel Studs in supporting partitions.

Pages 193-222. Safe loading tables Rolled Structural Steel Beams, Channels and Columns.

BERLOY

BERLOY METAL LUMBER

NOTES

Thicknesses .072 inch and heavier are used for load supporting Berloy Metal Lumber sections.

These safe loading tables are based on computations of elements of sections as described on pages 34-35 and noted on pages 36 to 40.

Reduced areas are calculated to allow for prongs in computation of elements of all joists and studs.

In all safe loading tables the pressed steel sections are assumed to be laterally braced as in properly erected floor and partition construction.

To find the reduction in fibre stress necessary to limit the deflection to not over 1/360 of span for beams, in joists or channels of depth in inches less than twice the span in feet, see table on page 135.

To find the deflection in inches of sections subjected to transverse fibre stress of 16,000 lbs. per square inch, see table of coefficients on page 136.

The spacing of joists at 15¾, 19 and 23½ inches is standard practice for floor construction, these spacings having been selected to allow for lapping of stock sheets of Ribplex or lath on top of joists. If irregular spacing is necessary to accommodate partitions, etc., involving the lapping of lath between joists, the lap should be at least 6 inches and the sheets be securely wired together.

The table on page 138 indicates for quick estimating purposes the approximate weight of pressed steel required per square foot of floor or roof surface for various depths of joists at different spacings, and notes the type of Ribplex or lath which should be used in each case.

Spacings of 23½ inches on centers should not be exceeded for floors, and 47-inch spacing should not be exceeded for roof construction.

BERLOY METAL LUMBER

The graphs on the following four pages indicate for quick reference the carrying capacities of the various standard Berloy joists for different spans, including loads from 60 pounds to 200 pounds per square foot and from 9-foot to 29-foot spans, also the average weight of steel joists per square foot of floor.

Joists of .120″ thickness are not included as they are intended for special cases of heavy loading or for trimmers, headers, etc.

The information given on the graphs is also given in the tables on pages 60 to 71, and 138.

Description of data.

NUMBERS IN TITLE

1st = Weight of joist per lineal foot.

2nd = Depth of joist.

3rd = Average weight of joists per square foot.

LEGEND

———————— = Joists spaced $23\frac{1}{2}''$ center to center.

——— ——— = Joists spaced $19''$ center to center.

— — — — — = Joists spaced $15\frac{3}{4}''$ center to center.

- - - - - - - - - = Joists spaced $12''$ center to center.

Note—The kind of line indicates the spacing; thus,
dotted line, short spacing (12″),
short dash line, the next wider spacing ($15\frac{3}{4}''$),
long dash line, the next wider spacing (19″),
1 the long continuous line, the widest spacing ($23\frac{1}{2}''$).

BERLOY METAL LUMBER

Spans 9 to 19 feet. Joist spacings 12 and 15¾ inches.

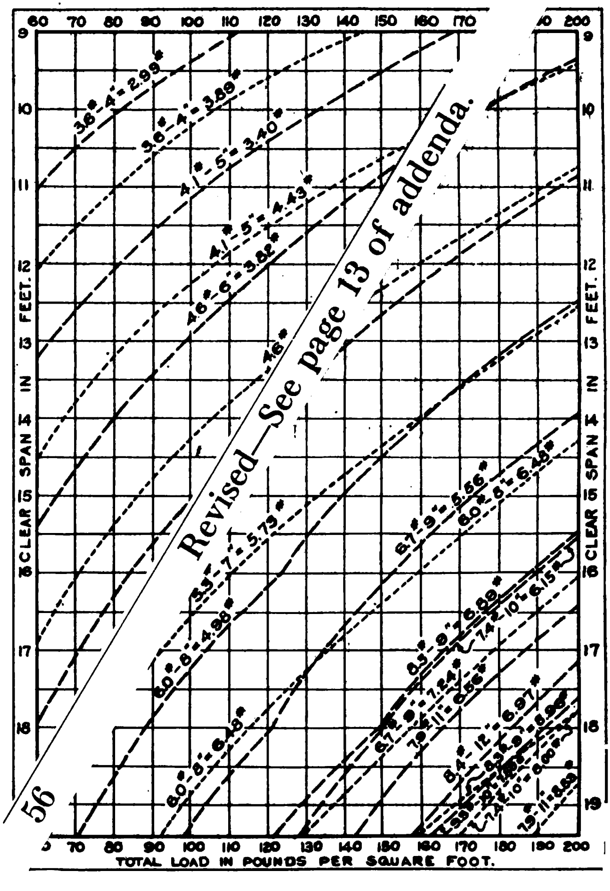


Figure No. 3

BERLOY METAL LUMBER

Spans 9 to 19 feet. Joist spacings 19 and 23 inches.

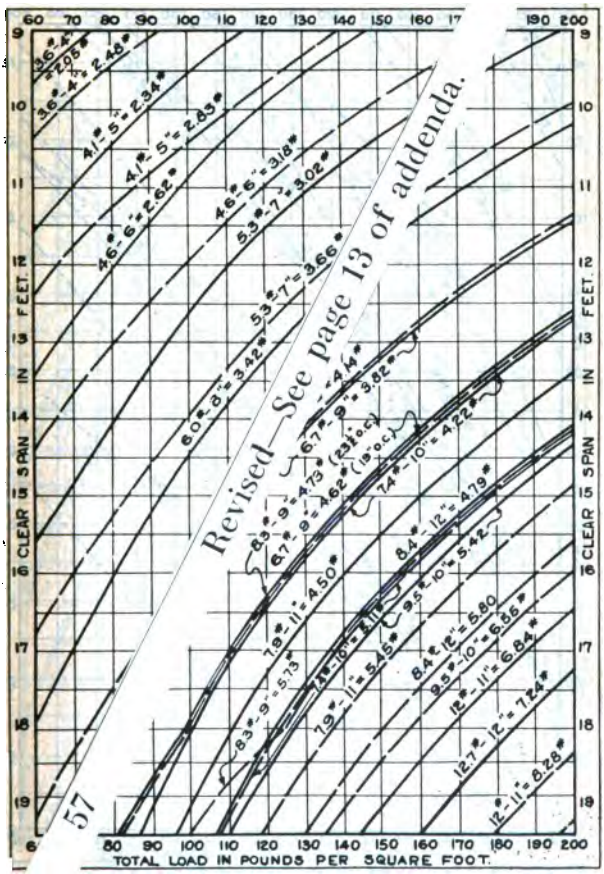


Figure No. 3a

BERLOY METAL LUMBER

Spans 19 to 29 feet. Joist spacings 12 and 15¾ inches.

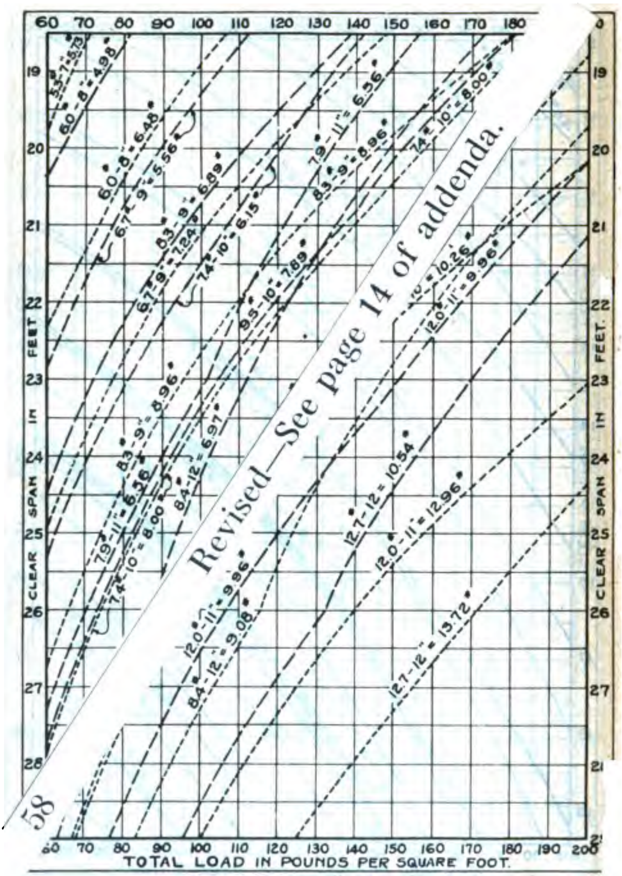


Figure No. 4

BERLOY METAL LUMBER

Spans 19 to 29 feet. Joist spacings 19 a 3½ inches.

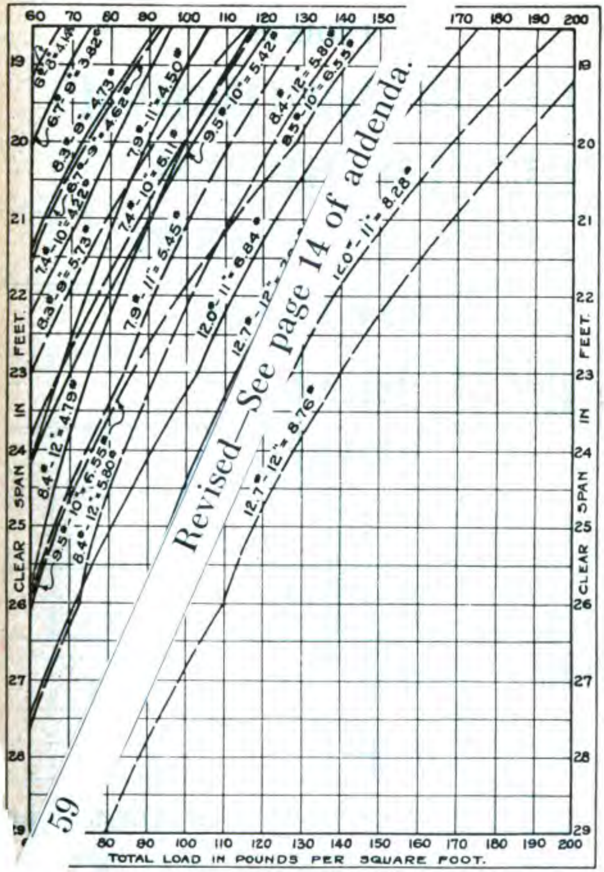


Figure No. 4a

BERLOY METAL LUMBER

Standard Metal Lumber I Joists. Total safe uniform loads in pounds. Fibre stress not over 16000 lbs. per square [illegible]h.

I JOISTS (A)

60 Revised—See page 15 of addenda.

Safe Uniform Loads in Pounds. Deflection Line Shown.

	4"		5"		6"		7"		8"	
Code Word	[illegible]ta	zeduz	zedev	zedoy	zeczy	zedat	zecux	zecwo	zecsa	zecte
Web Thickness	[illegible]	240	.144	.240	.144	.240	.144	.240	.144	.240
Weight	3.6	[illegible]	4.1	6.8	4.6	7.6	5.3	8.8	6.0	10.0
Sect. Modulus	1.2160	1.99[illegible]	[illegible]	2.7438	2.1584	3.5696	2.9474	4.8788	3.8567	6.3886
Clear Span in Feet										
6	2160	3552	29[illegible]	[illegible]	3840		5240			
7	1852	3045	2533	[illegible]	3290	5450	4495		5875	
8	1621	2665	2215	[illegible]	[illegible]80	4765	3930	6510	5140	
9	1440	2370	1971	3252	[illegible]	4240	3492	5780	4570	7570
10	1298	2130	1772	2925	[illegible]	[illegible]810	3145	5200	4115	6810
11	1180	1940	1610	2660	21[illegible]	[illegible]	2860	4730	3740	6190
12		1775	1477	2440	1920	[illegible]	2620	4340	3425	5680
13			1364	2250	1770	[illegible]	[illegible]20	4020	3165	5285
14				2090	1645	272[illegible]	[illegible]	3718	2938	4865
15				1950	1535	2540	[illegible]	[illegible]470	2742	4540
16						2380	19[illegible]	[illegible]	2570	4255
17						2240	1850	[illegible]	2420	4005
18						2120	1745	2[illegible]	[illegible]85	3785
19								2740	[illegible]	3585
20								2600	[illegible]	3410
21								2480		[illegible]
22										[illegible]
23										2[illegible]
24										2840
25										
26										
27										
28										
29										
30										

BERLOY METAL LUMBER

For maximum lengths of joists see page 44. Loads below heavy lines produce deflections greater than 1/360 of span.

Safe Uniform Loads

(B) I JOISTS

61

Revised—See page 15 of addenda.

Safe Uniform Loads in Pounds. Deflection Line Shown.

Depth	9"			10"			11"			12"		
	zecas	zecet	zeciv	zebse	zebvo	zebyx	zebar	zebit	zebov	zeask	zeatl	zeawn
Web Thickness	[illegible]	.144	.240	.184	.144	.240	.218	.144	.240	.218	.144	.240
Weight	8.3	[illegible]	[illegible]	9.5	7.4	12.4	12.0	7.9	13.2	12.7	8.4	14.0
Sect. Modulus	5.9336	4.8080	[illegible]	[illegible]	5.9574	9.8839	10.3194	6.8374	11.3505	11.7248	7.7657	12.8973
6												
7												
8												
9	7032	5699			[illegible]	[illegible]	[illegible]	7850				
10	6329	5129	8507	8104	6355	[illegible]	[illegible]	7065			7766	
11	5754	4663	7733	7368	5777	9584	[illegible]	[illegible]			7060	
12	5274	4274	7089	6754	5295	8786	[illegible]	[illegible]	9774	9771	6471	
13	4869	3946	6544	6234	4888	8110	[illegible]	[illegible]	[illegible]	9019	5974	9921
14	4521	3664	6076	5789	4539	7531	7617	[illegible]	[illegible]	8375	5547	9212
15	4219	3419	5671	5403	4236	7029	7109	4710	[illegible]	[illegible]	5177	8598
16	3956	3206	5317	5065	3972	6589	6665	4416	[illegible]	[illegible]	4854	8061
17	3723	3017	5004	4767	3738	6202	6273	4156	[illegible]	[illegible]	[illegible]	7587
18	3516	2850	4726	4502	3530	5857	5924	3925	6516	[illegible]	[illegible]	7165
19	3331	2699	4478	4265	3345	5549	5612	3719	6173	[illegible]	[illegible]	[illegible]
20	3165	2565	4254	4052	3177	5271	5332	3533	5864	5862	[illegible]	[illegible]
21	3014	2443	4051	3859	3026	5020	5078	3364	5585	5583	[illegible]	[illegible]
22	2877	2331	3867	3683	2888	4792	4847	3212	5331	5329	3530	[illegible]
23	2752	2230	3699	3524	2763	4584	4636	3072	5100	5098	3376	[illegible]
24	2637		3545	3377	2648	4393	4443	2944	4887	4885	3236	5374
25			3403	3242	2542	4217	4265	2826	4691	4690	3106	5159
26			3271	3117	2444	4055	4101	2717	4511	4510	2987	4960
27			3151	3002	2354	3905	3949	2617	4344	4343	2876	4777
28						3765	3808	2523	4189	4187	2773	4606
29						3635	3677	2436	4044	4043	2678	4447
30						3514	3554	2355	3910	3908	2589	4299

CLEAR SPAN IN FEET

BERLOY METAL LUMBER

Standard Metal Lumber I Joists. Total safe uniform loads in lbs. Fibre Stress not over 16000 lbs. per square inch.

I JOISTS (A)

Total Safe Uniform Loads in Pounds. No Excessive Deflection.

Revised—See page 16 of addenda.

h	4"		5"		6"		7"		8"	
Code 62	zedta	zeduz	zedev	zedoy	zeczy	zedat	zecux	zecwo	zecsa	zecte
Web Thickness		.240	.144	.240	.144	.240	.144	.240	.144	.240
Weight	[illegible]		4.1	6.8	4.6	7.6	5.3	8.8	6.0	10.0
Sect. Modulus	1.216	[illegible]	[illegible]	2.7438	2.1584	3.5696	2.9474	4.8788	3.8567	6.3886
CLEAR SPAN IN FEET 6	2160	3552	[illegible]	[illegible]	3840		5240			
7	1852	3045	[illegible]	[illegible]	3290	5450	4495		5875	
8	1621	2665	2215	[illegible]	[illegible]	4765	3930	6510	5140	
9	1322	2174	1971	[illegible]	[illegible]	4240	3492	5780	4570	7570
10	1072	1761	1772	2925	[illegible]	3810	3145	5200	4115	6810
11	885	1455	1509	2489	[illegible]	[illegible]	2860	4730	3740	6190
12	744	1222	1268	2092	1920	[illegible]	2620	4340	3425	5680
13	605	995	1080	1782	1690	[illegible]	[illegible]	4020	3165	5285
14	545	896	932	1537	1470	[illegible]	[illegible]	3718	2938	4865
15		780	812	1339	1290	2125	[illegible]	3316	2742	4540
16		688	713	1171	1120	1860	[illegible]	[illegible]	2570	4255
17		578	630	1036	996	1650	1560	[illegible]	2327	3856
18				972	895	1480	1391	[illegible]	[illegible]	3440
19				836	795	1315	1248	[illegible]	[illegible]	3087
20				760	720	1190	1127	1865	[illegible]	[illegible]
21						1080	1022	1692	[illegible]	[illegible]
22							932	1542	1389	[illegible]
23							852	1410	1271	[illegible]
24								1295	1167	1935
25										
26										
27										
28										
29										
30										

BERLOY METAL LUMBER

For maximum length of joists see page 44. N [illegible] dec-tion over 1/360 of span.

Safe Uniform Loads

(B)

I JOISTS

Total Safe Uniform Loads in Pounds. No Excessive Deflection.

Revised—See page 16 of addenda.

63

[illegible]th	9"			10"			11"			12"		
	[illegible]cas	zecet	zeciv	zebse	zebvo	zebyx	zebar	zebit	zebov	zeask	zeatl	zeawn
We[illegible] Thickness	[illegible]	[illegible]44	.240	.184	.144	.240	.218	.144	.240	.218	.144	.240
Weight	8.3	[illegible]	[illegible]	9.5	7.4	12.4	12.0	7.9	13.2	12.7	8.4	14.0
Sect. Modulus	5.9336	4.8086	7.[illegible]	[illegible]	[illegible]9574	9.8839	10.3194	6.8374	11.3505	11.7248	7.7657	12.8973
6												
7												
8												
9	7032	5699			7061			[illegible]50				
10	6329	5129	8507	8104	6355						7766	
11	5754	4663	7733	7368	5777	9584					7060	
12	5274	4274	7089	6754	5295	8786	8886	588[illegible]		9771	6471	
13	4869	3946	6544	6234	4888	8110	8203	5435	[illegible]	[illegible]	5974	9921
14	4521	3664	6076	5789	4539	7531	7617	5047	8378	[illegible]	[illegible]547	9212
15	4219	3419	5671	5403	4236	7029	7109	4710	7819	[illegible]	[illegible]	8598
16	3956	3206	5317	5065	3972	6589	6665	4416	7331	7328	[illegible]	[illegible]61
17	3723	3017	5004	4767	3738	6202	6273	4156	6899	6897	45[illegible]	[illegible]
18	3516	2850	4726	4502	3530	5857	5924	3925	6516	6514	4314	[illegible]
19	3206	2598	4309	4265	3345	5549	5612	3719	6173	6171	4087	67[illegible]
20	2907	2356	3908	4052	3177	5271	5332	3533	5864	5862	3883	6449
21	2626	2128	3529	3751	2941	4879	5078	3364	5585	5583	3698	6142
22	2410	1952	3238	3419	2681	4448	4847	3212	5331	5329	3530	5862
23	2176	1763	2924	3127	2452	4068	4636	3072	5100	5098	3376	5608
24	2019	1636	2714	2870	2250	3734	4280	2836	4707	4885	3236	5374
25	1860	1507	2499	2642	2071	3437	3946	2615	4340	4690	3106	5159
26	1718	1392	2308	2441	1914	3175	3646	2416	4010	4510	2987	4960
27	1600	1295	2223	2266	1777	2948	3384	2242	3722	4192	2776	4611
28				2106	1651	2739	3142	2082	3457	3894	2579	4284
29				1964	1540	2555	2937	1946	3230	3641	2411	4005
30				1835	1439	2387	2740	1816	3014	3395	2249	3734

CLEAR SPAN IN FEET

BERLOY METAL LUMBER

Standard Metal I Joists. Total safe unifor[m loa]ds in pounds per square foot. Fibre stress not over 16000 poun[ds per] square inch.

I JOISTS (A)

64

Revised—See page 17 of addenda.

Safe Uniform Loads in Pounds. No Excessive Deflection.

	4″		5″		6″		7″		8″	
Code	[illegible]	zeduz	zedev	zedoy	zeczy	zedat	zecux	zecwo	zecsa	zecte
Web Thickness	[illegible]	[illegible]	.144	.240	.144	.240	.144	.240	.144	.240
Weight	3.6	[illegible]	[illegible]	6.8	4.6	7.6	5.3	8.8	6.0	10.0
6	184	302	251		327		447			
7	135	222	185		[illegible]	389	327		428	
8	104	170	143	233	[illegible]	304	251	415	328	
9	75	123	112	185	[illegible]	[illegible]	198	328	259	429
10	55	90	90	149	118	[illegible]	161	265	210	348
11	41	68	70	116	98	[illegible]	[illegible]	219	173	287
12		52	54	89	82	135	[illegible]	184	145	241
13		39	42	70	66	110	[illegible]	[illegible]	124	207
14				56	54	89	82	[illegible]	107	177
15				46	44	73	68	[illegible]	[illegible]	154
16						59	56	93	[illegible]	136
17						50	47	77	[illegible]	[illegible]
18						42	39	65	59	[illegible]
19								55	50	[illegible]
20								48	43	71
21								41		62
22										53
23										47
24										41
25										
26										
27										
28										
29										
30										

CLEAR SPAN IN FEET

BERLOY METAL LUMBER

Square Foot Load Joists Spaced $23\frac{1}{2}''$ c/c

For maximum lengths of joists see page 44. Defle[illegible] not over 1/360 of span.

(B)

I JOISTS

Revised—See page 17 of addenda.

65

Safe Uniform Loads in Pounds. No Excessive Deflection.

Depth	9″		10″			11″			12″			
Code	zecas	zecet	zeciv	zebse	zebvo	zebyx	zebar	zebit	zebov	zeask	zeatl	zeawn
Thickness	[illegible]	.144	.240	.184	.144	.240	.218	.144	.240	.218	.144	.240
Weight	[illegible]	[illegible]	11.2	9.5	7.4	12.4	12.0	7.9	13.2	12.7	8.4	14.0
6												
7												
8												
9	400	324						446				
10	325	262	435	415	[illegible]	[illegible]	[illegible]	361			397	
11	267	216	359	342	270	[illegible]	[illegible]	298			327	
12	224	182	302	287	225	[illegible]	[illegible]	251	416	416	275	
13	191	155	257	245	192	319	[illegible]	[illegible]	355	355	235	389
14	165	134	222	211	166	275	278	[illegible]	[illegible]	305	203	336
15	144	116	193	184	144	240	242	[illegible]	[illegible]	266	176	292
16	126	102	170	162	127	210	213	141	[illegible]	[illegible]	155	257
17	112	91	150	143	112	186	188	125	[illegible]	[illegible]	137	228
18	100	80	134	128	100	166	168	111	185	[illegible]	[illegible]	203
19	86	70	116	115	90	149	151	100	166	[illegible]	[illegible]	182
20	74	60	100	103	81	135	136	90	150	150	[illegible]	[illegible]
21	64	52	86	91	72	119	124	82	136	136	[illegible]	[illegible]
22	56	45	75	80	62	103	112	75	124	124	82	[illegible]
23	48	39	65	70	55	90	103	68	113	113	75	125
24	43		58	61	48	80	91	61	100	104	69	114
25			51	54	42	70	81	54	89	96	64	106
26			45	48		62	72	48	79	89	59	98
27			42	43		56	64	43	70	80	53	87
28				39		50	57	38	63	71	47	77
29						46	52		58	65	43	71
30						41	47		51	58	38	64

CLEAR SPAN IN FEET

BERLOY METAL LUMBER

Standard Metal Lumber I Joists. Total safe uniforr [illegible]is in pounds per square foot. Fibre stress not over 16000 pounds [illegible]quare inch.

I JOISTS (A)

66 Revised—See page 18 of addenda.

Safe Uniform Loads in Pounds. No Excessive Deflection.

	4"		5"		6"		7"		8"	
Code W.	[illegible]a	zeduz	zedev	zedoy	zeczy	zedat	zecux	zecwo	zecsa	zecte
Web Thickness	[illegible]	.240	.144	.240	.144	.240	.144	.240	.144	.240
Weight	3.6	[illegible]	[illegible]	6.8	4.6	7.6	5.3	8.8	6.0	10.0
CLEAR SPAN IN FEET										
6	228	375			404					
7	168	276	229		297		406			
8	128	211	175	[illegible]	[illegible]	376	311		407	
9	93	153	139	228	[illegible]	297	246	406	321	
10	68	112	112	185	[illegible]	[illegible]	199	329	260	431
11	51	84	87	143	121	[illegible]	164	272	215	356
12		64	67	110	101	[illegible]	[illegible]	229	180	299
13		49	53	87	82	[illegible]	[illegible]	195	154	257
14		41	42	70	66	110	[illegible]	[illegible]	133	220
15				57	54	90	[illegible]	[illegible]	115	191
16				46	44	73	70	[illegible]	[illegible]	168
17					37	61	58	[illegible]	[illegible]	144
18						52	49	81	[illegible]	121
19						44	41	69	[illegible]	[illegible]
20								59	53	[illegible]
21								51	46	[illegible]
22								44	40	65
23										58
24										51
25										
26										
27										
28										
29										
30										

BERLOY METAL LUMBER

For maximum lengths of joists see page 4[illegible] [illegible]eflection not over 1/360 of span.

Square Foot Load Joists Spaced 19″ c/c

(B) I JOISTS

67

Revised—See page 18 of addenda.

Safe Uniform Loads in Pounds. No Excessive Deflection.

	9″			10″			11″			12″		
Word	[illegible]	[illegible]et	zeciv	zebse	zebvo	zebyx	zebar	zebit	zebov	zeask	zeatl	zeawn
Web Thickness	.17[illegible]	[illegible]	[illegible]40	.184	.144	.240	.218	.144	.240	.218	.144	.240
Weight	8.3	6.7	[illegible]	[illegible]	7.4	12.4	12.0	7.9	13.2	12.7	8.4	14.0
6												
7												
8												
9		400										
10	400	324			401							
11	331	268	444	423	331						406	
12	278	225	373	356	279						341	
13	236	192	318	303	238	394	400	264	[illegible]	[illegible]40	291	
14	204	165	274	261	205	340	344	228	37[illegible]	[illegible]	250	415
15	177	144	238	228	178	296	299	198	329	[illegible]	[illegible]18	362
16	156	127	210	200	156	260	274	174	290	29[illegible]	[illegible]	319
17	138	112	186	177	139	230	233	154	256	256	[illegible]	[illegible]
18	123	100	166	158	124	206	208	138	228	228	151	[illegible]
19	106	86	143	141	111	184	186	123	204	204	135	[illegible]
20	92	74	123	128	100	166	168	111	185	185	122	203
21	79	64	106	113	88	147	153	101	168	168	111	185
22	69	56	93	98	77	127	139	92	153	153	101	168
23	60	48	80	86	67	112	127	84	140	140	93	154
24	53	43	71	75	59	98	113	75	124	128	85	142
25	47	38	63	67	52	87	100	66	109	118	78	130
26	42		56	60	47	77	89	59	98	110	72	121
27			52	53	42	69	79	53	87	98	65	108
28				47	37	62	71	47	78	88	58	97
29				42		56	64	42	70	80	53	87
30				38		50	58	38	63	72	47	79

CLEAR SPAN IN FEET

BERLOY METAL LUMBER

Standard Metal Lumber I Joists. Total safe uniform loa[illegible] [illegible] lbs. per square foot. Fibre stress not over 16000 lbs. per squar[illegible]

I JOISTS (A)

Safe Uniform Loads in Pounds. No Excessive Deflection.

L	4"		5"		6"		7"		8"	
Code Wo[illegible]	68 [illegible]a	zeduz	zedev	zedoy	zeczy	zedat	zecux	zecwo	zecsa	zecte
Web Thickness		240	.144	.240	.144	.240	.144	.240	.144	.240
Weight	3.6		4.1	6.8	4.6	7.6	5.3	8.8	6.0	10.0
6	275	452								
7	203	333	[illegible]		358					
8	154	254	212		274		375			
9	112	184	167		[illegible]17	358	296		387	
10	82	135	135	224		290	240	397	314	
11	61	100	104	172		241	197	326	258	427
12	47	78	81	133	[illegible]	[illegible]	167	276	218	361
13		58	64	105	99		142	236	186	310
14		49	51	84	80		[illegible]22	202	160	265
15		40	41	68	66	[illegible]		169	140	231
16				56	53	88		139	123	203
17				47	45	74		[illegible]16	105	173
18				41		63	59		88	146
19						53	51		75	124
20						45	43	[illegible]	[illegible]	106
21								62		92
22								54		80
23								47	[illegible]	
24								41		
25										
26										
27										
28										
29										
30										

CLEAR SPAN IN FEET

Revised—See page 19 of addenda.

BERLOY METAL LUMBER

…uare Foot Load
…oists Space
$15\frac{3}{4}''$ c/…

For maximum lengths of joists see page 44. Deflecti… not over 1/360 of span.

(B)

I JOISTS

Revised—See page 19 of addenda.

Safe Uniform Loads in Pounds. No Excessive Deflection.

	9"			10"			11"			12"		
Code Word		zecet	zeciv	zebse	zebvo	zebyx	zebar	zebit	zebov	zeask	zeatl	zeawn
Web Thickness	.1.	69	.240	.184	.144	.240	.218	.144	.240	.218	.144	.240
Weight	8.3	6.		9.5	7.4	12.4	12.0	7.9	13.2	12.7	8.4	14.0
CLEAR SPAN IN FEET												
6												
7												
8												
9												
10		390										
11	398	322			399							
12	335	270		428	336			373			410	
13	285	231	383	365	286			[illegible]			350	
14	246	199	330	315	246	410	415	[illegible]			301	
15	214	173	288	274	214	357	360	[illegible]	[illegible]	396	258	436
16	188	153	253	241	189	313	317	210	[illegible]	349	231	384
17	167	135	224	214	167	278	281	186	[illegible]	[illegible]	204	340
18	149	121	200	191	149	248	250	166	275	[illegible]	183	303
19	128	104	173	170	134	222	224	149	247	[illegible]	[illegible]	272
20	111	90	149	152	121	200	203	134	223	223	[illegible]	245
21	95	78	128	136	107	177	184	122	202	202	[illegible]	[illegible]
22	83	68	112	118	93	153	168	111	185	185	124	[illegible]
23	72	59	97	104	81	135	154	102	169	169	112	[illegible]
24	64	52	86	91	71	118	136	90	149	155	103	170
25	57	46	76	81	63	105	120	80	132	143	95	157
26	50	41	68	72	56	93	107	71	117	132	88	145
27	45		63	64	50	83	95	63	105	118	78	130
28				57	45	74	85	57	94	106	70	116
29				52	41	67	77	51	85	96	63	105
30				47		61	70	46	77	86	57	95

BERLOY METAL LUMBER

Standard Metal Lumber I Joists. Total safe uniform loads in pounds per square foot. Fibre stress not over 16000 pounds per [illegible]e inch.

I JOISTS (A)

70 Revised—See page 20 of addenda.

Safe Uniform Loads in Pounds. No Excessive Deflection.

	4"		5"		6"		7"		8"	
Code W[illegible]	[illegible]ta	zeduz	zedev	zedoy	zeczy	zedat	zecux	zecwo	zecsa	zecte
Web Thickness	[illegible]	.240	.144	.240	.144	.240	.144	.240	.144	.240
Weight	3.6	[illegible]	4.1	6.8	4.6	7.6	5.3	8.8	6.0	10.0
CLEAR SPAN IN FEET 6	360		362							
7	266		[illegible]							
8	203	333	277	[illegible]	360					
9	147	241	219	[illegible]	[illegible]		388			
10	107	176	177	293	[illegible]	381	315		412	
11	80	132	137	226	[illegible]	[illegible]	260		340	
12	62	102	106	174	160	[illegible]	218	362	285	
13	47	77	83	137	130	[illegible]	186	309	244	406
14	39	64	67	110	105	[illegible]	[illegible]	265	210	347
15		52	54	90	86	142	[illegible]	221	183	302
16		43	45	73	70	116	[illegible]	[illegible]	160	267
17			37	61	59	97	92	[illegible]	137	227
18				54	50	82	77	[illegible]	115	191
19				44	42	70	67	[illegible]	[illegible]	162
20				38		59	56	93	[illegible]	139
21						51	49	81	[illegible]	[illegible]
22							42	70	63	[illegible]
23							37	61	55	[illegible]
24								54	49	[illegible]
25										
26										
27										
28										
29										
30										

BERLOY METAL LUMBER

Square Foot Load
Joists Spaced 12″c/c

For maximum length of joists see page 44. Deflection not over 1/360 of span.

(B) I JOISTS

Safe Uniform Loads in Pounds. No Excessive Deflection.

Revised—See page 20 of addenda.

Depth	9″			10″			11″			12″		
	zecas	zecet	zeciv	zebse	zebvo	zebyx	zebar	zebit	zebov	zeask	zeatl	zeawn
Web Thickness	[illegible]	.144	.240	.184	.144	.240	.218	.144	.240	.218	.144	.240
Weight	8.5	[illegible]	[illegible]	9.5	7.4	12.4	12.0	7.9	13.2	12.7	8.4	14.0
Clear Span in Feet												
6												
7												
8												
9												
10												
11												
12		356										
13	374	303			376							
14	322	261		413	324						396	
15	281	228	378	360	282			[illegible]			345	
16	247	200	332	316	248	411		276	[illegible]		303	
17	219	178	294	280	220	365	368	244	[illegible]		269	
18	195	158	262	250	196	325	329	218	362	[illegible]	[illegible]	398
19	169	137	227	224	176	292	295	196	325	[illegible]	[illegible]	357
20	145	118	195	203	159	264	267	177	293	293	[illegible]	[illegible]
21	125	101	168	179	140	232	242	160	266	266	[illegible]	[illegible]
22	109	89	147	155	122	202	220	146	242	242	160	[illegible]
23	95	77	127	136	106	177	201	133	222	222	146	[illegible]
24	84	68	113	119	94	156	178	118	196	204	135	224
25	74	60	100	106	83	137	158	104	173	187	124	206
26	66	53	89	94	74	122	140	93	154	173	115	191
27	59	48	82	84	66	109	125	83	138	155	103	171
28				75	59	98	112	74	123	139	92	153
29				67	53	88	101	67	111	125	83	138
30				61	48	79	91	61	100	113	75	124

71

BERLOY METAL LUMBER

Standard Metal Lumber Channel Joists. Total safe [illegible]rm loads in pounds. Fibre stress not over 16000 pounds per s[illegible] inch.

CHANNEL JOISTS (A)

72 Revised—See page 21 of addenda.

Safe Uniform Loads in Pounds. Deflection Line Shown.

	4"		5"		6"		7"		8"	
Code W[illegible]	[illegible]b	zeguc	zegbo	zegiz	zefwe	zefzo	zefub	zefva	zefix	zefoz
Web Thickness	[illegible]	120	.072	.120	.072	.120	.072	.120	.072	.120
Weight	1.80	[illegible]	[illegible].05	3.40	2.30	3.80	2.65	4.40	3.00	5.00
Sect. Modulus	.5659	.9305	[illegible]	1.2868	1.0171	1.6833	1.4013	2.3205	1.8454	3.0551
CLEAR SPAN IN FEET										
6	1005	1654	1390	[illegible]	1810					
7	863	1418	1192	[illegible]	[illegible]	2570	2135		2812	
8	755	1241	1043	[illegible]	[illegible]	2240	1868	3095	2460	
9	671	1103	927	1525	[illegible]	[illegible]	1660	2750	2188	3620
10	604	993	835	1372	[illegible]	[illegible]	1495	2475	1968	3260
11	549	902	758	1248	985	[illegible]	[illegible]	2250	1790	2962
12	503	827	695	1144	904	[illegible]	[illegible]	2062	1640	2715
13	464	763	642	1056	835	1380	[illegible]	1904	1514	2506
14			596	980	775	1280	[illegible]	[illegible]	1405	2328
15			556	915	725	1195	[illegible]	[illegible]	1312	2171
16			521	858	680	1120	934	[illegible]	[illegible]	2038
17					640	1055	880	[illegible]	[illegible]	1916
18					605	1000	831	1375	[illegible]	[illegible]
19					570	945	787	1302	[illegible]	[illegible]
20					545	900	748	1237	984	[illegible]
21					515	855	712	1178	938	[illegible]
22						815	680	1125	895	1481
23						780		1076	857	1416
24						750		1031	821	1357
25								990	786	1304
26								952	755	1253
27								917	727	1207
28								884		1164
[illegible]								853		1124
								825		1086

BERLOY METAL LUMBER

Safe Uniform Loads

For maximum length of joists see page 45. Loads [illegible] heavy lines produce deflections greater than 1/360 o[illegible] [illegible]a.

(B) CHANNEL JOISTS

73 Revised—See page 21 of addenda.

[illegible] Uniform Loads in Pounds. Deflection Line Shown.

[illegible]h	9"			10"			11"			12"		
[illegible]	[illegible]rk	zeewp	zefav	zeemf	zeeng	zeeph	zeect	zeegy	zeeld	zedve	zedyo	zeebs
Web Thickness	[illegible]	[illegible]72	.120	.092	.072	.120	.109	.072	.120	.109	.072	.120
Weight	4.15	[illegible]	[illegible]	4.75	3.70	6.20	6.00	3.95	6.60	6.35	4.20	7.00
Sect. Modulus	2.8513	2.3113	3.[illegible]	[illegible]	2.8751	4.7709	4.9895	3.3055	5.4882	5.6777	3.7601	6.2458
6												
7												
8												
9	3379	2739			3408	[illegible]	[illegible]	3795			4178	
10	3041	2465	4090	3911	3067	[illegible]	[illegible]	[illegible]16	[illegible]		3760	
11	2765	2241	3718	3556	2788	4626	[illegible]	[illegible]	[illegible]		3418	
12	2535	2054	3408	3260	2556	4241	4297	[illegible]	[illegible]26	4731	3133	
13	2340	1896	3074	3009	2359	3915	3966	26[illegible]	[illegible]	4367	2892	4804
14	2172	1761	2921	2794	2191	3635	3683	2440	[illegible]	[illegible]55	2686	4461
15	2028	1644	2726	2608	2045	3393	3437	2277	37[illegible]	[illegible]	2507	4164
16	1901	1541	2556	2445	1917	3181	3222	2135	3544	[illegible]	[illegible]	3904
17	1789	1450	2406	2301	1804	2994	3033	2009	3336	334[illegible]	[illegible]	3674
18	1690	1370	2272	2173	1704	2827	2864	1898	3151	3154	[illegible]	[illegible]
19	1601	1298	2152	2059	1614	2678	2714	1798	2985	2988	1979	[illegible]
20	1521	1233	2045	1956	1533	2544	2578	1708	2836	2839	1880	[illegible]
21	1448	1174	1947	1863	1460	2423	2455	1627	2701	2704	1791	2974
22	1382	1121	1859	1778	1394	2313	2344	1553	2578	2581	1709	2839
23	1322	1072	1778	1701	1333	2213	2242	1485	2466	2469	1635	2716
24	1267	1027	1704	1630	1278	2120	2148	1423	2363	2366	1567	2602
25	1217	986	1636	1565	1227	2035	2062	1366	2268	2271	1504	2498
26	1170	948	1573	1504	1180	1957	1983	1314	2181	2184	1446	2402
27	1126	913	1515	1449	1136	1885	1910	1265	2100	2103	1393	2313
28	1086	880	1461	1397	1095	1818	1841	1220	2025	2028	1343	2231
29	1049	850	1410	1352	1058	1755	1778	1179	1956	1958	1297	2154
30	1014	822	1363	1304	1022	1696	1719	1139	1890	1893	1253	2082

CLEAR SPAN IN FEET

BERLOY METAL LUMBER

Standard Metal Lumber Channel Joists. Total safe uniform loads in pounds. Fibre stress not over 16000 pounds per square in

CHANNEL JOISTS (A)

74 Revised—See page 22 of addenda.

Safe Uniform Loads in Pounds. No Excessive Deflection.

[illegible]h	4″		5″		6″		7″		8″	
Code	zegob	zeguc	zegbo	zegiz	zefwe	zefzo	zefub	zefva	zefix	zefoz
Web Thickness	[illegible]	.120	.072	.120	.072	.120	.072	.120	.072	.120
Weight	[illegible]	[illegible]	2.05	3.40	2.30	3.80	2.65	4.40	3.00	5.00
Sect. Modulus	.5659	[illegible]	[illegible]	1.2868	1.0171	1.6833	1.4013	2.3205	1.8454	3.0551
CLEAR SPAN IN FEET 6	1005	1654	[illegible]	[illegible]	1810					
7	863	1418	[illegible]	[illegible]	1550	2570	2135		2812	
8	755	1241	1043	[illegible]	1360	2240	1868	3095	2460	
9	630	1040	927	[illegible]	[illegible]	1990	1660	2750	2188	3620
10	511	840	835	1372	[illegible]	1795	1495	2475	1968	3260
11	423	694	726	1194	[illegible]	1630	1358	2250	1790	2962
12	355	584	610	1050	[illegible]	[illegible]	1245	2062	1640	2715
13		497	520	855	810	[illegible]	1150	1904	1514	2506
14		429	448	737	695	[illegible]	[illegible]	1767	1405	2328
15				642	605	1005	[illegible]	1605	1312	2171
16				564	530	900	[illegible]	[illegible]	1230	2038
17				500	470	780	[illegible]	[illegible]	1131	1872
18					420	695	673	[illegible]	1009	1670
19					380	625	604	[illegible]	[illegible]	1499
20						565	545	903	[illegible]	1353
21						510		819	[illegible]	[illegible]
22								746	[illegible]	[illegible]
23								683	618	[illegible]
24									567	[illegible]
25										
26										
27										
28										
29										

BERLOY METAL LUMBER

Safe Uniform Loads

For maximum length of joists see page 45. No deflections over 1/360 of span.

(B) CHANNEL JOISTS

Safe Uniform Loads in Pounds. No Excessive Deflection.

Revised—See page 22 of addenda.

75

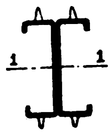
Depth	9"			10"			11"			12"		
Name	zeerk	zeewp	zefav	zeemf	zeeng	zeeph	zeect	zeegy	zeeld	zedve	zedyo	zeebs
Web Thickness	[illegible]	.072	.120	.092	.072	.120	.109	.072	.120	.109	.072	.120
Weight	[illegible]	[illegible]	5.60	4.75	3.70	6.20	6.00	3.95	6.60	6.35	4.20	7.00
Sect. Modulus	2.8513	[illegible]	[illegible]	[illegible]	2.8751	4.7709	4.9895	3.3055	5.4882	5.6777	3.7601	6.2458
6												
7												
8												
9	3379	2739			[illegible]	[illegible]	[illegible]	3795			4178	
10	3041	2465	4090	3911	3067	[illegible]	[illegible]	3416			3760	
11	2765	2241	3718	3556	2788	[illegible]	[illegible]	3105			3418	
12	2535	2054	3408	3260	2556	4241	[illegible]	[illegible]	4726	4731	3133	
13	2340	1896	3074	3009	2359	3915	[illegible]	[illegible]	4362	4367	2892	4804
14	2172	1761	2921	2794	2191	3635	3683	[illegible]	[illegible]	4055	2686	4461
15	2028	1644	2726	2608	2045	3393	3437	[illegible]	[illegible]	3785	2507	4164
16	1901	1541	2556	2445	1917	3181	3222	2135	[illegible]	[illegible]	2350	3904
17	1789	1450	2406	2301	1804	2994	3033	2009	[illegible]	[illegible]	2212	3674
18	1690	1370	2272	2173	1704	2827	2864	1898	3151	[illegible]	[illegible]	3470
19	1569	1272	2109	2059	1614	2678	2714	1798	2985	[illegible]	[illegible]	3287
20	1416	1148	1903	1956	1533	2544	2578	1708	2836	2839	[illegible]	[illegible]
21	1284	1041	1727	1830	1435	2381	2455	1627	2701	2704	[illegible]	[illegible]
22	1178	955	1584	1679	1317	2184	2344	1553	2578	2581	1709	[illegible]
23	1070	868	1439	1526	1196	1985	2280	1510	2508	2469	1635	[illegible]
24	983	797	1322	1401	1099	1823	2094	1387	2303	2366	1567	[illegible]
25	906	735	1218	1291	1012	1680	1930	1279	2123	2271	1504	2498
26	837	679	1125	1193	935	1552	1783	1181	1961	2184	1446	2402
27	777	630	1044	1107	868	1440	1655	1096	1820	2051	1359	2256
28	722	585	970	1028	806	1338	1537	1018	1691	1905	1262	2096
29	684	554	919	974	764	1268	1456	965	1602	1805	1196	1986
30	629	510	846	897	703	1167	1340	888	1474	1661	1100	1828

CLEAR SPAN IN FEET

BERLOY METAL LUMBER

H STUDS (IN PARTITIONS)
SAFE LOADS IN POUNDS PER STUD

Values based on axis 1-1 for studs in partition construction. Fibre stresses = 13,000 lbs. for lengths under 60 radii. For lengths over 60 radii fibre stresses computed by American Bridge Formula f = 19,000—100 l/r. No loads given where l/r exceeds 120.



Depth	4"		5"		6"		7"		8"	
Code Word	zejod	zejuf	zejeb	zejic	zejbe	zejdo	zeirl	zejaz	zeikd	zeilf
Weight	3.60	6.00	4.10	6.80	4.60	7.60	5.30	8.80	6.00	10.00
Thickness	.144	.240	.144	.240	.144	.240	.144	.240	.144	.240
Length										
7' 0"	12640	21060	14500	24180	16400	27300	19180	31980	22000	36670
8' 0"	12250	20640	14500	24180	16400	27300	19180	31980	22000	36670
9' 0"	11460	19120	14500	24180	16400	27300	19180	31980	22000	36670
10' 0"	10690	17820	13880	23120	16400	27300	19180	31980	22000	36670
11' 0"	9910	16360	13170	21880	16300	27050	19180	31980	22000	36670
12' 0"	9140	15070	12430	20670	15550	25900	19180	31980	22000	36670
13' 0"	8360	13780	11710	19440	14890	24830	18960	31600	22000	36670
14' 0"	7580	12480	11160	18240	14190	23600	18280	30200	22000	36[illegible]
15' 0"			10240	17020	13500	22400	17580	29250	21660	361[illegible]
16' 0"			9510	15800	12800	21200	16880	28100	20990	34[illegible]

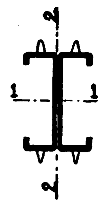
Total Web Thickness Given

BERLOY METAL LUMBER

"H" STUDS (UNSUPPORTED)

Safe Loads in Pounds for Unsupported "H" Studs Used as Columns

Values based on axis 2-2. Fibre stresses 13,000 lbs. for lengths under 60 radii. For lengths over 60 radii fibre stresses computed by American Bridge Co. formula f = 19,000—100 l/r.

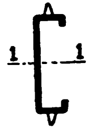


Depth	4"		5"		6"		7"		8"	
Code Word	zejod	zejuf	zejeb	zejic	zejbe	zejdo	zeirl	zejaz	zeikd	zeilf
Weight	3.60	6.00	4.10	6.80	4.60	7.60	5.30	8.80	6.00	10.00
Web Thickness	.144	.240	.144	.240	.144	.240	.144	.240	.144	.240
Length 7′ 0″	7000	11420	7150	11720	7050	11550	10920	17950	14720	24500
8′ 0″	5350	8830	5130	8375	4660	7550	8410	13900	10580	20300
9′ 0″	3745	6080	3125	4930	2200	3460	5975	9850	9730	16050
10′ 0″	2090	3320	1115	1580			3540	5660	7290	11820
11′ 0″	485	565					1110	1660	4775	7760
12′ 0″									2290	3580

Loads below heavy lines are for values of l/r greater than 120.

BERLOY METAL LUMBER

CHANNEL STUDS (IN PARTITIONS)
SAFE LOADS IN POUNDS PER STUD



Values based on axis 1–1 for studs in partition construction. Fibre stresses 13,000 lbs. for lengths under 60 radii. For lengths over 60 radii fibre stresses computed by American Bridge formula f = 19,000–100 l/r. No loads given where l/r exceeds 120.

Depth	4"		5"		6"		7"		8"	
Code Word	zekof	zekug	zekfo	zekid	zekce	zekec	zekab	zekba	zejyg	zejza
Weight	1.80	3.00	2.05	3.40	2.30	3.80	2.65	4.40	3.00	5.00
Thickness	.072	.120	.072	.120	.072	.120	.072	.120	.072	.120
Length										
7′ 0"	6320	10530	7250	12090	8200	13650	9590	15990	11000	18335
8′ 0"	6125	10370	7250	12090	8200	13650	9590	15990	11000	18335
9′ 0"	5730	9560	7250	12090	8200	13650	9590	15990	11000	18335
10′ 0"	5345	8910	6940	11560	8200	13650	9590	15990	11000	18335
11′ 0"	4955	8180	6585	10940	8120	13650	9590	15990	11000	18335
12′ 0"	4570	7535	6215	10335	7770	12950	9590	15990	11000	18335
13′ 0"	4180	6890	5860	9720	7430	12340	9480	15800	11000	18335
14′ 0"	3790	6240	5580	9120	7080	11800	9140	15100	11000	18335
15′ 0"			5120	8510	6730	11200	8790	14625	10830	1805[illegible]
16′ 0"			4755	7900	6400	10600	8440	14050	10495	174[illegible]

Channel studs should not be used exclusively in supporting partitions, at least eve fourth or fifth stud should be of H section to afford stiffness to the structure.

BERLOY METAL LUMBER

CONSTRUCTION DETAILS

The Berloy Metal Lumber type of construction is principally adapted to buildings with light floor load requirements and consists of fire-resistive floors, roofs, walls, partitions and ceilings, involving the use of pressed steel joists and studs with Berloy Ribplex, diamond mesh lath, clips, etc., making a complete line of materials for such structures.

In selecting materials and methods of construction it is first necessary to classify the building being considered under one of the following types of structures, i. e.:

(1) **Residential buildings,** such as houses, bungalows, etc.

(2) **Public buildings,** such as office buildings, banks, hotels, club houses, schools, hospitals, churches, colleges, dormitories, apartment houses, retail stores, garages, etc.

(3) **Industrial buildings,** such as factories, warehouses, mill buildings, etc.

Metal Lumber is the logical and ideal type of construction for structures noted in the first and second groups of buildings, i. e., residences and public buildings, each of which have light floor load requirements (40 to 150 pounds per square foot), and as a rule require flat plastered ceilings.

These requirements are best satisfied by a light weight, easily erected type of construction, insuring economy of design and speedy erection; and by a moderately deep construction which eliminates cracking of plaster from excessive deflection.

Metal Lumber floor or roof construction complete, including finish floor and plastered ceiling, will weigh approximately 50% less than other types of fire-resistive construction, and its weight (35 to 40 pounds per square foot) does not exceed the live load which it is designed to carry, thus insuring maximum economy in the entire design of the building.

All pressed steel carrying members in the Berloy Metal Lumber type of construction are factory made products and therefore are subject to inspection and test before installation, thus eliminating the uncertain human factor, and the possibility of defective materials so prevalent in the heavier types of construction involving a large amount of field labor and the use of a variety of materials.

Berloy pressed steel sections are calculated upon the same basis and in the same way as hot rolled structural steel shapes and therefore also require a depth of section which produces minimum deflection, this together with the use of Ribplex or diamond mesh lath provides the most desirable type of ceiling construction on the market.

BERLOY METAL LUMBER

Metal Lumber floor construction is not recommended for the heavier portions of structures noted in the third group of buildings, i. e.: factories, warehouses, mill buildings, etc.

Pressed steel joists or studs are not intended to replace the usual types of structural steel or reinforced concrete skeleton frame structures, but they are designed to replace the heavier and less economical types of tile or concrete floor panels or the use of inflammable wood joists.

These panel loads are in turn supported by masonry walls or members of the structural frame of the building.

Berloy Pressed Steel Studs and Ribplex or lath, with plaster, form light weight, economical, fire-resistive bearing, or non-bearing partitions.

The general plan of the pressed steel structure being based on joist and stud construction permits of the simplicity and ease of design and erection of wood construction. It also provides in its place an economical fire-resistive structure.

In replacing the heavier types of construction, it provides one man members, and a great saving in the total weight of materials, without loss of fire-resistive qualities and with a substantial saving in time and cost.

Figure No. 5 shows in comparison the simplicity of design, and the small dead weight of Berloy Pressed Steel floor construction to be handled in erection and carried by the walls or structural frame as compared with other usual present day types of fire-resistive construction.

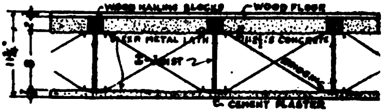
Figure No. 6 shows in detail the construction based upon various spacings of joists used for floor and roof construction.

Prongs may be punched in the flanges of Berloy sections made of material of .092 inch thickness and lighter. Where metal plastering lath is applied, the lath is pushed over the prong and the prong hammered down. In heavier gauges ⅜-inch holes may be punched in the lower flanges of joists to which the lath can be readily and economically attached by means of wire.

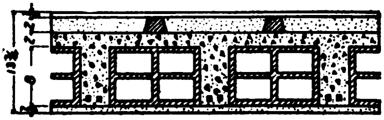
Berloy Metal Lumber is adaptable to any type of building construction. In addition to floor, roof and partition construction the various products herein illustrated offer practically unlimited opportunities for use in various portions of structures such as: light roof structures; additional stories to present buildings; balcony floors; complete, light weight, easily designed and erected built-up balconies; light bridges connecting buildings; elevator and stair enclosures; forming proscenium or groined arches; running tracks; driers; suspended ceilings, false columns, beams or cornices.

DETAILS OF DESIGN

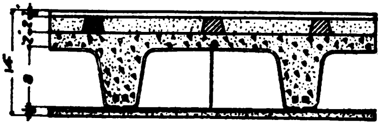
Chart showing comparative weights (dead loads) of standard fire-proof floor constructions. The weights are calculated for constructions of the same strength on equal spans and show an accurate comparison.



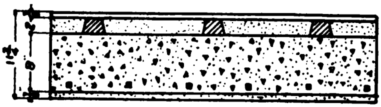
Berloy Metal Lumber—Weight, 35 lbs. per sq. foot



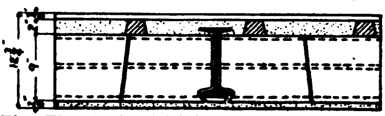
Concrete Joist—Hollow Tile—Weight, 102 lbs. per sq. foot



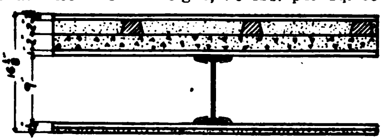
Concrete Joist—Steel Cores—Weight, 86 lbs. per sq. foot



Reinforced Concrete Slab—Weight, 130 lbs. per sq. foot



Flat Tile Arch—Weight, 70 lbs. per sq. foot



Concrete Slab—Plate Reinforcement—Weight, 74 lbs. per sq. foot

Figure No. 5

BERLOY METAL LUMBER

MATERIALS OF CONSTRUCTION AND STANDARD DETAILS OF DESIGN

Berloy I-Joists.—The entire load carrying portion of the floor or roof structure is contained in the pressed steel sections. The steel from which these sections are fabricated is of special analysis, the physical elements carefully proportioned, and providing a material meeting the requirements of the Standard Specifications for Structural Steel for Buildings. Serial Designation A9-16 American Society For Testing Materials.

The integrity of the material is assured in the finished product as the process of forming and fabrication cannot be successfully accomplished with defective or imperfect material.

Simple inspection involving spacing and sufficient bearing on supports is all that is required to entirely eliminate from the structure proper any uncertain personal factor, and the use of Berloy products removes any possible question as to the quality of the material, therefore the structure complete is practically fool proof.

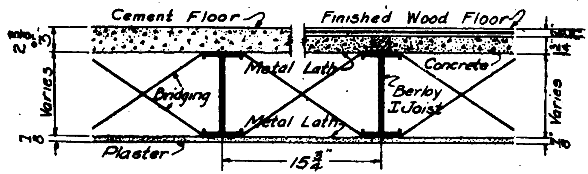
Bending Moments.—Pressed steel joists used as simple beams should in all cases be taken as WL/8, where W represents the total load and L the length of the span. For end spans, continuous over one support, figure WL/9. For interior spans, continuous over two supports, figure WL/10.

It is not generally advisable to use joists over about 25 feet in length, unless the saving effected in the size of the joists figured as continuous beams will compensate for the additional expense involved in handling, hoisting and installing long length members.

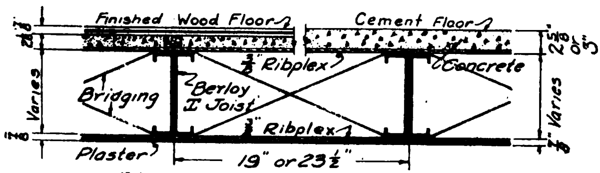
Smaller units are much more easily and quickly handled and therefore permit of greater speed in erection.

DETAILS OF DESIGN

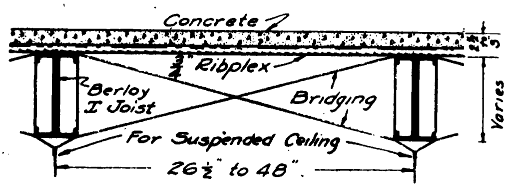
The following details and information under the heading Details of Design are suggestive of the possibilities and adaptability of Berloy Metal Lumber to various building requirements.



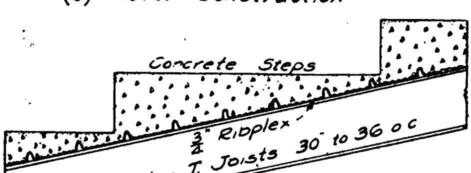
(a) Floor Construction



(b) Floor Construction



(c) Roof Construction



(d) Balcony Construction

Figure No. 6

BERLOY METAL LUMBER

AUDITORIUM FLOORS

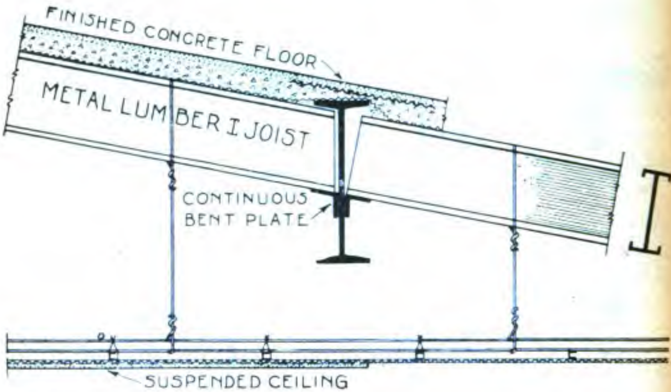


FIG. 6-E

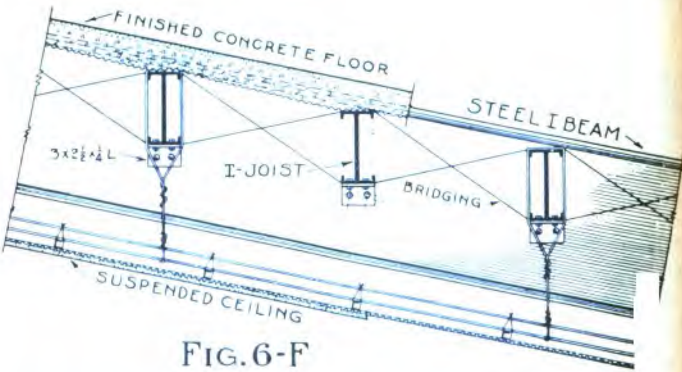


FIG. 6-F

Inclined floors of auditoriums, balconies and ramps, al[so] for sloping roof construction.

DETAILS OF DESIGN

GRAND STAND AND BALCONY CONSTRUCTION

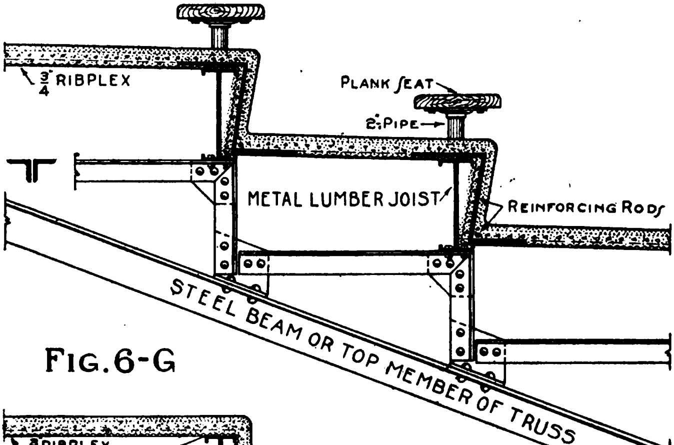


FIG. 6-G

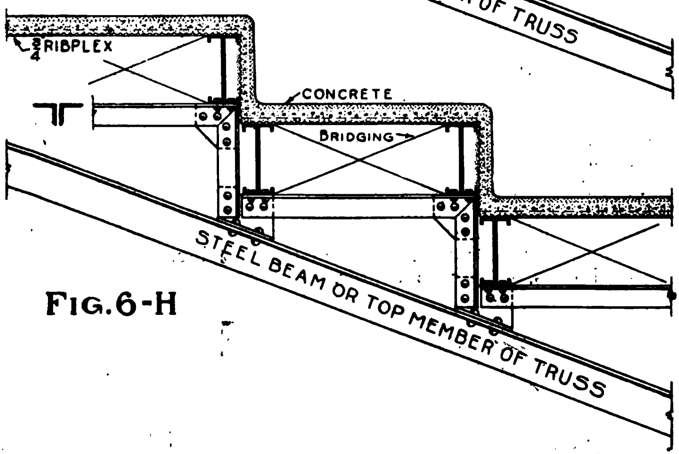


FIG. 6-H

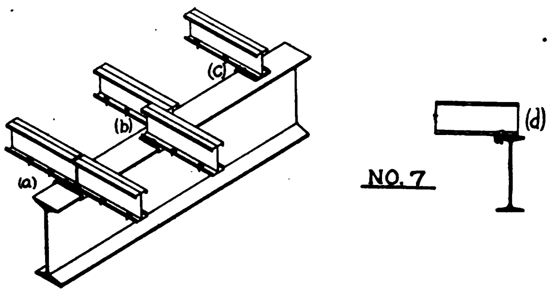
Risers and seat platforms for Balconies and Grand Stands.

BERLOY METAL LUMBER

BEARINGS

As the Berloy Pressed Steel Sections are of known quality and integrity, the principal questions in design are those of providing proper bearings and details of design, therefore we lay greatest stress on these subjects.

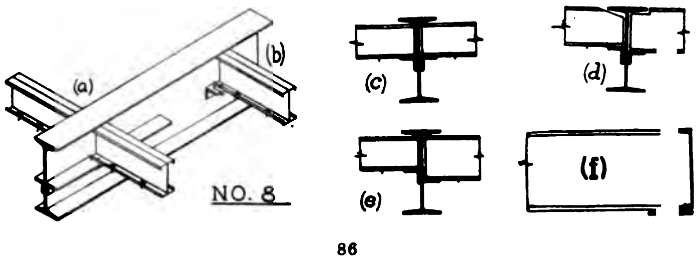
The proper spacing of joists and types and gauges of lath or Ribplex for various conditions are given in table on page 114.



Joists Bearing on Structural Steel Beams or Channels.—(7a) Butt joints, two joists should not bear on a beam flange in this manner unless the flange is at least 5½ inches wide. A clearance of ½ inch should be allowed between the ends of the joists.

(b, c and d) Lap joints and single joists, the ends of the joists should extend slightly over the center of the beam as shown. See beam clip details, page 107.

Note: All pressed steel joists resting on top of beams or channels should be the same depth regardless of span, the gauge and spacing being varied to meet the load requirement. The maximum spacing for floor joists being 23½ inches and for roof joists 47 inches, center to center.



DETAILS OF DESIGN

Joists Bearing on Shelf Angles Riveted to Webs of Beams and Channels.—Use not less than 3″ x 2½″ x ¼″ shelf angles with 3-inch leg outstanding. The sizes of the angle may be varied to suit conditions, but not less than 2½-inch bearing should be provided.

For details of lengths of joists see pages 94 and 95.

(8a) Bearing consisting of continuous angle.

(b) Bearing on short lengths of angles at points of support.

(c) Cross section showing joists bearing on shelf angles.

(d and e) Cross sections showing arrangement of shelf angles to receive joists of different depths on either side of the channel or beam, also showing both bevel and square corner coping.

(f) Cross section, structural steel around stairways or elevators.

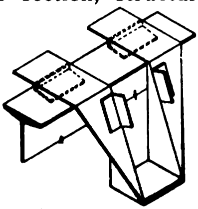


Figure No. 9-A

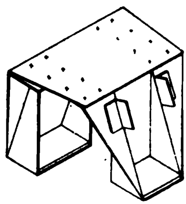


Figure No. 9-B

Joists Bearing on Berloy Joist Hangers.—(9a) Single hanger. (9b) Double hanger. See details of hangers, pages 108-109.

These hangers are specially made to support Berloy Pressed Steel Joists on the sides of structural steel beams or channels, in a similar manner to and replacing shelf angles. Hangers should not be used on or supported by pressed steel sections. The hanger is of heavy gauge material and affords support to the sides of the top flange of the joists.

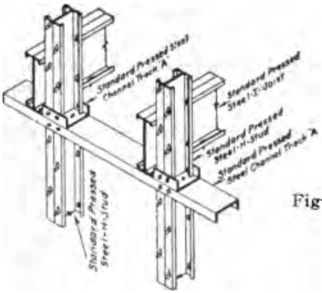


Figure No. 10

BERLOY METAL LUMBER

Joists Bearing on Supporting Partitions.—The standard pressed steel channel track "A" is not less than 4 inches wide. The joists should be located over or close to the supporting studs and secured to the track with $\frac{5}{16}$-inch stove bolts or soft cold-driven rivets. Studs of supporting partitions should be located and installed as shown, and bear on the entire 4-inch width of track. All pressed steel joists resting on top of a bearing partition should be of the same depth regardless of span, the gauge and spacing being varied to meet the load requirement. The maximum spacing for floor joists being 23½ inches on centers and for roof joists 47 inches, center to center.

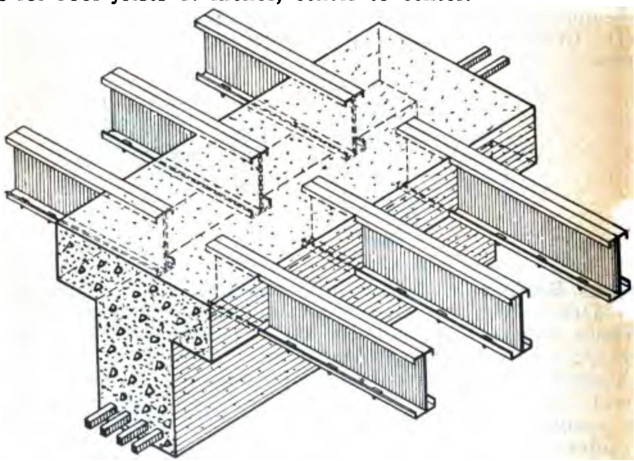


Figure No. 11

Showing Metal Joists Supported by Reinforced Concrete Beams

Joists Bearing on Reinforced Concrete Beams.—Reinforced concrete beams also form a desirable bearing for pressed steel joists.

The joists are rigidly held in position without the use of clips. The beams allow of maximum depth with but small projection below the ceiling without the use of shelf angles or hangers. The beam is of economical construction and includes its own fireproofing.

This type of construction makes no change in the usual rules following good practice in the designing of reinforced concrete tee beams.

DETAILS OF DESIGN

The depth of the upper flange is usually made the same as the depth of the joists entering into it. Different size joists may be used on opposite sides of the beam if desired. The depth of the concrete beam for calculation is figured as from the center of the reinforcing steel in the bottom, to the top of the structural concrete which can be poured continuously in one operation. Any concrete extending above the level of the top of the joists can only be figured in the effective depth of the beam when poured with the stem and not cut across by nailing strips or sleepers.

Wood forms are built for the web and the under part of the flange in the usual manner. The joists should then be installed, being supported on the top of the board forming the centering under the flange, spaced as indicated by the plans. Fillers are then inserted between the joists to form the sides of the flange.

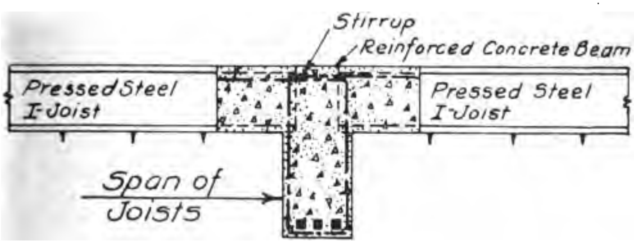


Figure No. 12

Joists Bearing on Web of Concrete Beam.—If the joists extend into the web of the concrete beam, the web should be wide enough to allow 2-inch bearing for the joists in the web and allow room between the ends of the joists for the bent up bars (if used), this space should not be less than 4 inches for one bar nor less than 6 inches for two bars. See cut No. 12.

The span of the joists should be figured as the clear distance between the outer sides of the webs of the tee beam.

BERLOY METAL LUMBER

The pressed steel joists should be assumed as simple beams unless the joists are positively connected (or continuous) through the concrete beam to joists in an adjoining span. In such cases bent up bars cannot be used in the concrete beam and the shearing value of the beam should be based on the shearing value of the concrete only.

Stirrups (not smaller than ¼″ round) as shown, should be located, one at the side of each joist or line of joists, and additional ones at the ends of the concrete beams if required to resist shearing stresses. See figure No. 12.

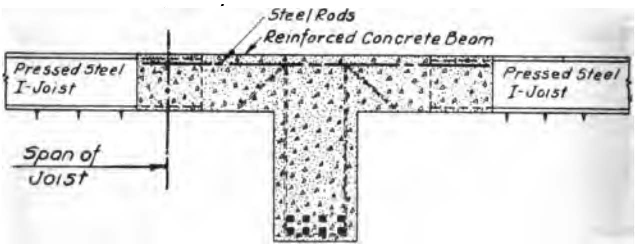


Figure No. 13

Joists Bearing in Flange of Concrete Beam.—In the case of tee beams with wide flanges the pressed steel joists should extend into the flange not less than 4 inches for 4 and 5-inch joists, nor less than 6 inches for 6 and 8-inch joists and not less than 8 inches for 9, 10, and 12-inch joists. Calculated span of the joists should be from center to center of bearing of the joists in the flar ;e. See figure No. 13.

The overhanging flange surrounding the joist should be g-ured as a cantilever beam and reinforced with at least two r(ls, one on each side of the joist as shown in figure No. 14. ' ıe length of this concrete flange figured as the cantilever beam p-

DETAILS OF DESIGN

porting each metal joist should not exceed three times the width of the flange of the metal joist.

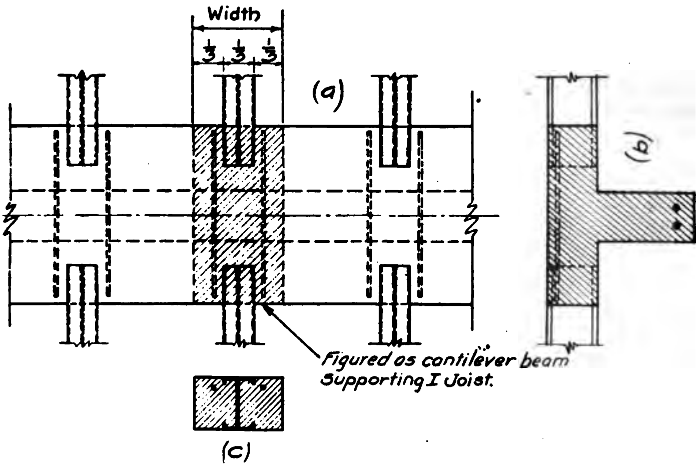


Figure No. 14

The usual type of stirrups should also be installed in the concrete beam to resist shearing stresses where required.

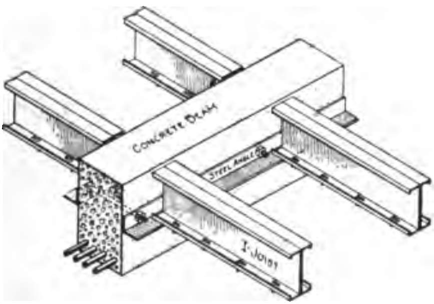


Figure No. 15

BERLOY METAL LUMBER

Joists Bearing on Angles on Sides of Rectangular Concret Beams.—Joists may rest on shelf angles on the sides of rec tangular beams in a similar manner to installing them on shel angles on steel beams, see figures No. 8a and b, and 15.

The shelf angles are secured to the concrete beams by expan sion or through bolts. The bolts should be located in all case above the reinforcing bars in the lower part of the concret beam.

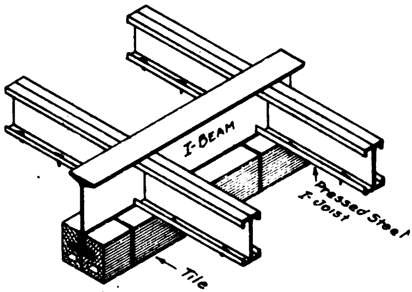


Figure No. 16

Joists Bearing on Terra Cotta Tile Blocks.—This forms a com bined bearing and beam protection below the joists. Plenty o strong portland cement mortar should be used in installing th terra cotta blocks. The joists should bear at least 4 inches o the tile. See figure No. 16.

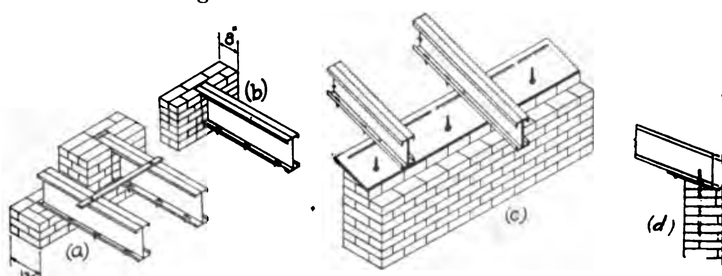


Figure No. 17

DETAILS OF DESIGN

Joist Bearing on Brick Walls.—(17a) **Bearings for pressed steel joists on brick walls should equal one-half the depth of the joists, but in no case be less than 4 inches.**

(b) For light loadings where 8½-inch wall is permissible, a 4-inch bearing may be used.

Wall anchors may readily be installed when desired, various types are described on page 106.

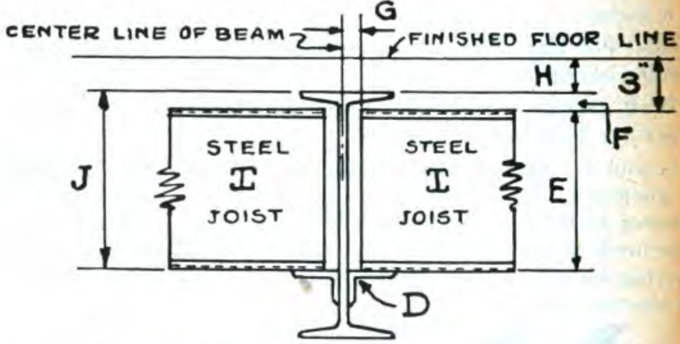
(c and d) **Bearing Plate for Rafters of Pitch Roof.**—The plate is anchored to the wall with anchor bolts, the joists may be secured to the plate with stove bolts, or soft cold driven rivets. The brick shelf and the projection of the anchor bolts form a good bearing for the brick wall above, which wall should be built up to the top flange of the joists.

Figure No. 18

Joists Braced During Erection.—To aid in the rapid erection of joists of long span the Berloy method of bracing as shown above should be used. The braced couple of joists (bolted together) should be the first joists placed in panels of over 16-foot span. They should be located in the center of the panel to form a backbone as it were for the installation of the other joists in the panel. As the adjoining single joists are placed they can be temporarily tied to the braced couple with the light wood strips described under Details of Erection, page 141.

BERLOY METAL LUMBER

METAL LUMBER CLEARANCES



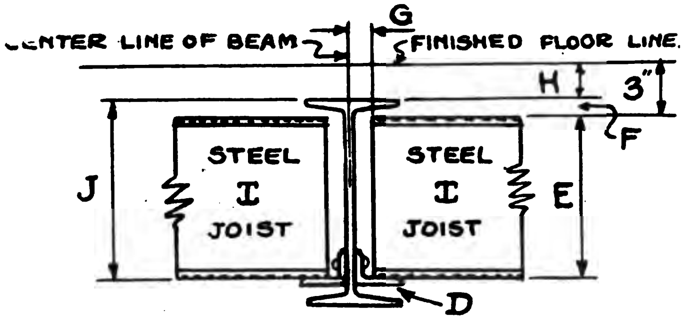
Proper clearances for Berloy Metal Lumber Joists supported on top of shelf angles between structural steel I Beams. Table based on 3″ floor thickness above joists. All angles must have long leg outstanding to support joists with 2½″ mininum bearing.

TABLE "A"

SIZE OF STEEL I BEAM		D	E	F	G	H	J
Standard	Bethlehem	Size of Angle	Max. Size of Joist	Top Clearance	End Clearance		
8″-I @ 18.4 # 20.5 #	8″-I @ 17.5 # 19.5 #	3″ x2½″x¼″	4″	¾″	¾″	2¼″	4¾″
9″-I @ 21.8 # 25 #	9″-I @ 20 #-24 #	3″ x2½″x¼″	5″	¾″	¾″	2¼″	5¾″
10″-I @ 25.4 # 30 #	10″-I @ 23.5 # 28.5 #	3″ x2½″x¼″	6″	¾″	¾″	2¼″	6¾″
12″-I @ 31.8 # 35 #	12″-I @ 28.5 #- 32 #-36 #	3″ x2½″x¼″	7″	1″	¾″	2″	8″
15″-I @ 42.9 # 45 #	15″-I @ 38 #-41 #- 46 #-54 #	3″ x2½″x¼″	10″	1″	¾″	2″	11″
18″-I @ 54.7 # 60 #	18″-I @ 48.5 #- 52 #-54 #-59 #	3″ x2½″x¼″	12″	1⅛″	¾″	1⅞″	13″
20″-I @ 65.4 # 70 #-75 #	20″-I @ 59 #-64 #- 69 #-72 #-82 #	3½″x2½″x¼″	12″	1⅛″	⅞″	1⅞″	13⅛″
	24″-I @ 73 #-83 #	3″ x2½″x¼″	12″	1⅛″	¾″	1⅞″	13⅛″
	26″-I @ 90 #	3½″x2½″x¼″	12″	1¼″	¾″	1¾″	[illegible]⅛″
20″-I @ 81.4 # (Spec.)		3½″x2½″x¼″	12″	1¼″	⅞″	1¾″	[illegible]¼″
24″-I @ 79.9 # 85 #-90 #	28″-I @ 105 #	3½″x2½″x¼″	12″	1¼″	⅞″	1¾″	[illegible]¼″
	30″-I @ 120 #	3½″x2½″x¼″	12″	1⅜″	⅞″	1⅝″	[illegible]⅜″

DETAILS OF DESIGN

METAL LUMBER CLEARANCES



Proper clearances for Berloy Metal Lumber Joists supported on inverted shelf angles, between structural steel I Beams. Table based on 3" floor thickness above joists. All angles must have long leg outstanding to support joists with 2½" minimum bearing.

TABLE "B"

SIZE OF STEEL I BEAM		D	E	F	G	H	J
Standard	Bethlehem	Size of Angle	Max. Size of Joist	Top Clearance	End Clearance		
6"–I @ 12.5 # 14.75 #–17.25 #		3½"x2½"x¼"	4"	⅝"	1"	2⅜"	4⅝"
7"–I @ 15.3 # 17.5 #–20 #		3½"x2½"x¼"	5"	⅝"	1"	2⅜"	5⅝"
8"–I @ 18.4 # 20.5 #	8"–I @ 17.5 #– 19.5 #	3½"x2½"x¼"	6"	¾"	1⅛"	2¼"	6¾"
9"–I @ 21.8 # 2[illegible]	9"–I @ 20 #–24 #	3½"x2½"x¼"	7"	¾"	1⅛"	2¼"	7¾"
10"-[illegible] @ 25.4 # 3[illegible]	10"–I @ 23.5 #– 28.5 #	3½"x2½"x¼"	8"	¾"	1⅛"	2¼"	8¾"
12"-[illegible] @ 31.8 # 3[illegible]	12"–I @ 28.5 #– 32 #–36 #	3½"x2½"x¼"	10"	¾"	1⅛"	2¼"	10¾"
15"-[illegible] @ 42.9 # 45 [illegible] 50 #–55 #	15"–I @ 38 #–41 #– 46 #–54 #–64 #	3½"x2½"x¼"	12"	1"	1⅛"	2"	13"

BERLOY METAL LUMBER

Framing Around Floor Openings.—Only small openings should be framed with pressed steel sections, such as vent and flue openings, small skylights, around chimneys, etc.

Stairways, elevators and large skylights should be framed with structural steel or reinforced concrete beams.

Pressed steel sections should in no case rest on chimney walls nor extend through flues or vents.

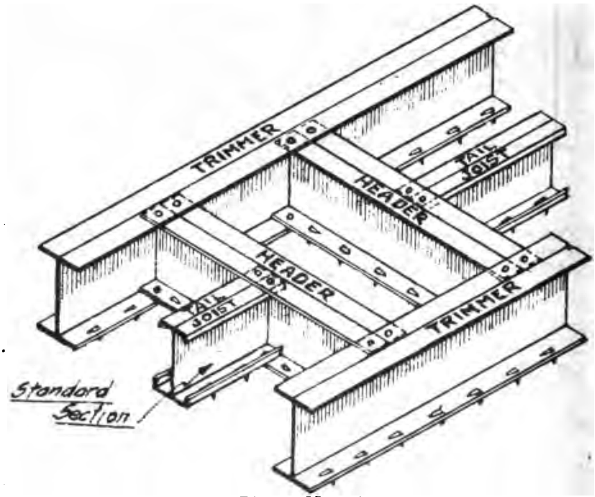


Figure No. 19

Figures Nos. 19, 20, 21 and 22 suggest various methods of framing around openings. Drawing No. 19 illustrates the use of special Berloy Pressed Steel Joists. The headers should be ¼ inch oversize, and the trimmers ½ inch oversize. The tail joists should be standard sizes. Standard 11 gauge angle connecti^ns to the webs of joists may be used as shown in figure No. 2 if desired. Such connections are more expensive than flange c ı-nections, but are more positive in results and should be usec n the more important cases, such as where partitions occur arc d openings, etc.

All connections in either case should be made with $\frac{5}{16}$-i h rivets or bolts, rivets to be driven cold on the job.

DETAILS OF DESIGN

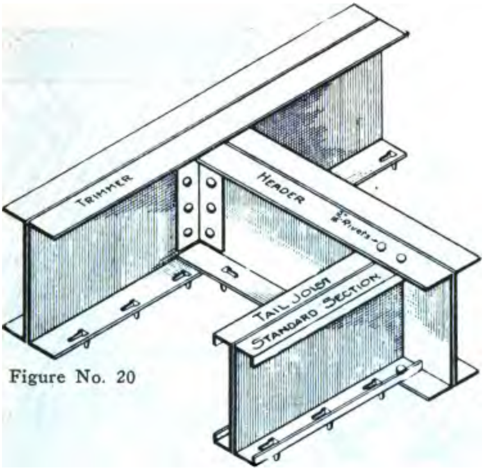


Figure No. 20

It is our practice to punch holes in the .120 inch thickness sections in the shop before shipment. Punching of lighter materials to be field work, this can readily be accomplished with hand punches.

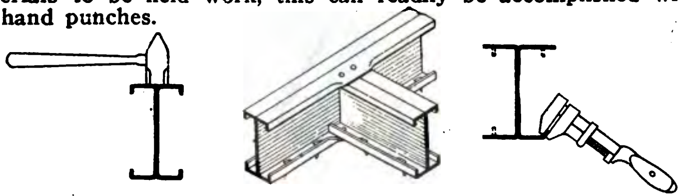


Figure No. 21

. Figure No. 21 illustrates an effective and economical method of field framing with standard sections around small openings. Th vertical projections of the top and bottom flanges of the he ders or trimmers are bent out flat at the point of connection, usi g a wrench and hammer. The ends of the inserted joists ar slightly reduced in depth by hammering top and bottom with a l eavy hammer. These connections are also made with $\frac{5}{16}$-inch co -driven rivets, or bolts.

gures No. 8f (pg. 86) and No. 22 on the following page sugge methods of framing around openings with structural steel an so bearings of pressed steel joists on the framing members.

BERLOY METAL LUMBER

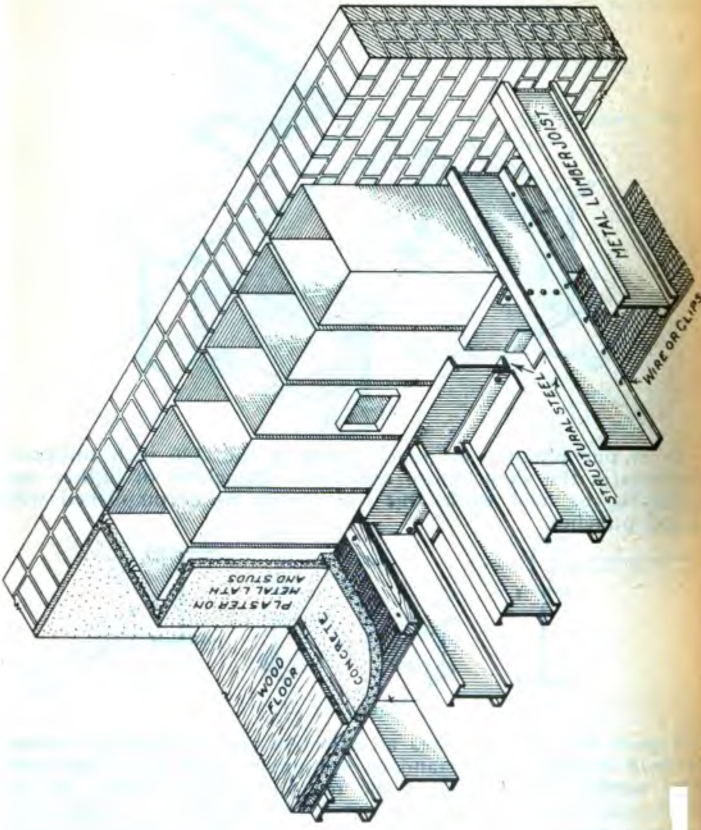


Figure No. 22

Typical floor opening around ducts, elevators, large skylig ts and stairways. Principal framing of structural steel. Also sh -ing metal lath partition.

DETAILS OF DESIGN

ROOF CONSTRUCTION

Figure No. 23

The adaptability of Berloy Metal Lumber to any details of construction, brings within the range of possibility, strong, light weight, fire-resistive, easily erected roof structures. The best results are obtained by submitting the plans to this company for detailing, thus insuring the most economical design, best connections, etc.

Concrete fill, nalecode, sheathing or other roofing materials may be readily applied over the joists.

The following data is given as a suggestion for detailing the angle cuts, connections, etc., for ridge and valley roof members.

BERLOY METAL LUMBER

ROOF CONSTRUCTION

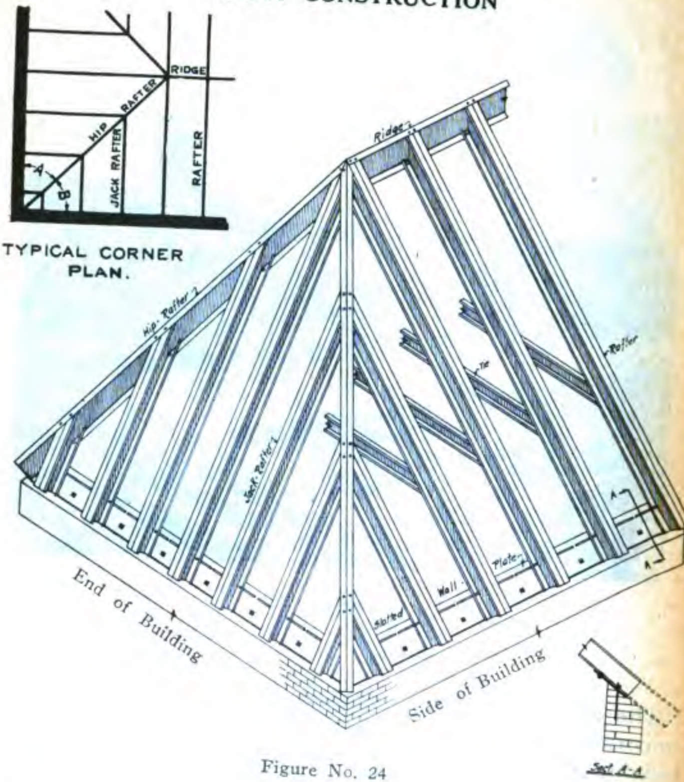


Figure No. 24

KEY

d—Depth of rafter in inches.

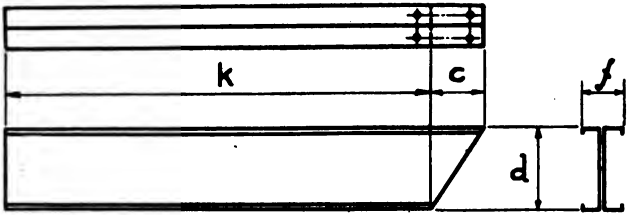
r—Slope or pitch of roof expressed as a fraction, i. e., a 9 in. 12 i ch would be 9/12.

f—Width of flange in inches.

A and B—Angles that the hip or valley make with the walls, measur in the horizontal.

DETAILS OF DESIGN

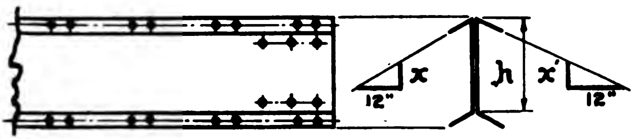
ROOF CONSTRUCTION



RAFTER

Figure No. 25

$$c = dr$$



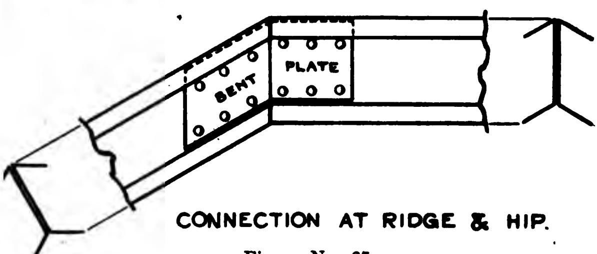
RIDGE

Figure No. 26

$$h = \sqrt{d^2 + (dr)^2}$$

x or x′ = slope of roof (i. e., rise in 12″)

x = x′ if the slope on the opposite sides of the ridge are alike.

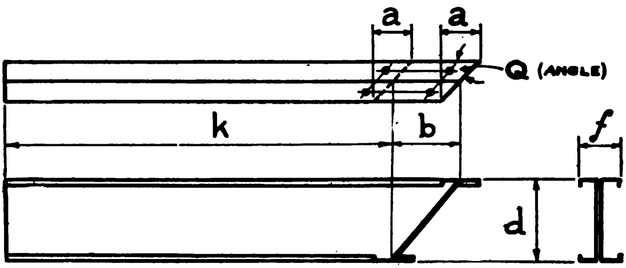


CONNECTION AT RIDGE & HIP.

Figure No. 27

BERLOY METAL LUMBER

ROOF CONSTRUCTION



JACK RAFTER

Figure No. 28

Case 1—Where angle A and angle B both are 45°.

$$b = dr$$

$$\text{Tan. } Q = \frac{1}{\sqrt{1+r^2}}$$

$$a = f\sqrt{1+r^2}$$

Case 2—Where angle A and angle B are not 45°.

$b = dr$ (r for ends and r for sides are not alike.)

Jack rafters, end of building

$$\text{Tan. } Q = \frac{\text{Cot } A}{\sqrt{1+r^2}} \text{ (r for ends)}$$

$$a = \frac{f\sqrt{1+r^2}}{\text{Cot } A} \text{ (r for ends)}$$

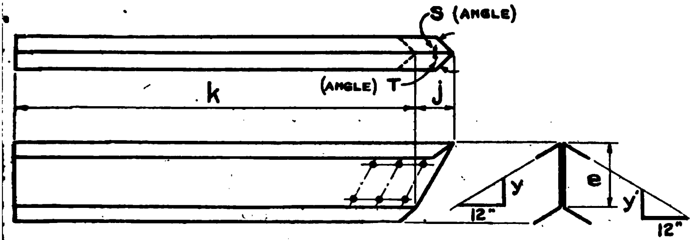
Jack rafters, side of building

$$\text{Tan. } Q = \frac{\text{Cot } B}{\sqrt{1+r^2}} \text{ (r for sides)}$$

$$a = \frac{f\sqrt{1+r^2}}{\text{Cot } B} \text{ (r for sides)}$$

DETAILS OF DESIGN

ROOF CONSTRUCTION



HIP RAFTER
Figure No. 29

Case 1—When angle A and angle B both are 45°.

$$y \text{ or } y' = \frac{8.484r}{\sqrt{.5r^2+1}}. \qquad {}^*e = \frac{1.414\,h}{\sqrt{r^2+2}}. \qquad {}^*j = \frac{hr}{\sqrt{r^2+2}}.$$

$$\text{Tan. S or Tan. T} = \frac{1}{\sqrt{r^2+1}}$$

Case 2—Where angle A and Angle B are not 45°.

$$y = \frac{12r \text{ Cos A}}{\sqrt{r^2 \sin^2 A+1}} \quad \text{(r for ends)}$$

$$\text{or } y' = \frac{12r \text{ Cos B}}{\sqrt{r^2 \sin^2 B+1}} \quad \text{(r for sides)}$$

$$^*e = \frac{h \text{ Cosec A}}{\sqrt{r^2+\text{Cosec}^2 A}} \quad \text{(r for ends)}$$

$$\text{or } ^*e = \frac{h \text{ Cosec B}}{\sqrt{r^2+\text{Cosec}^2 B}} \quad \text{(r for sides)}$$

$$^*j = \frac{hr}{\sqrt{r^2+\text{Cosec}^2 A}} \quad \text{(r for ends)}$$

$$\text{or } ^*j = \frac{hr}{\sqrt{r^2+\text{Cosec}^2 B}} \quad \text{(r for sides)}$$

$$\text{Tan. S} = \frac{\text{Cot A}}{\sqrt{1+r^2}} \quad \text{(r for ends)}$$

$$\text{Tan. T} = \frac{\text{Cot B}}{\sqrt{1+r^2}} \quad \text{(r for sides)}$$

T same formulae may be used for a Valley Rafter, in which case the inges are turned up.

*] r the value of "h," see Ridge Rafter.

BERLOY METAL LUMBER

DOORWAYS IN SUPPORTING PARTITIONS

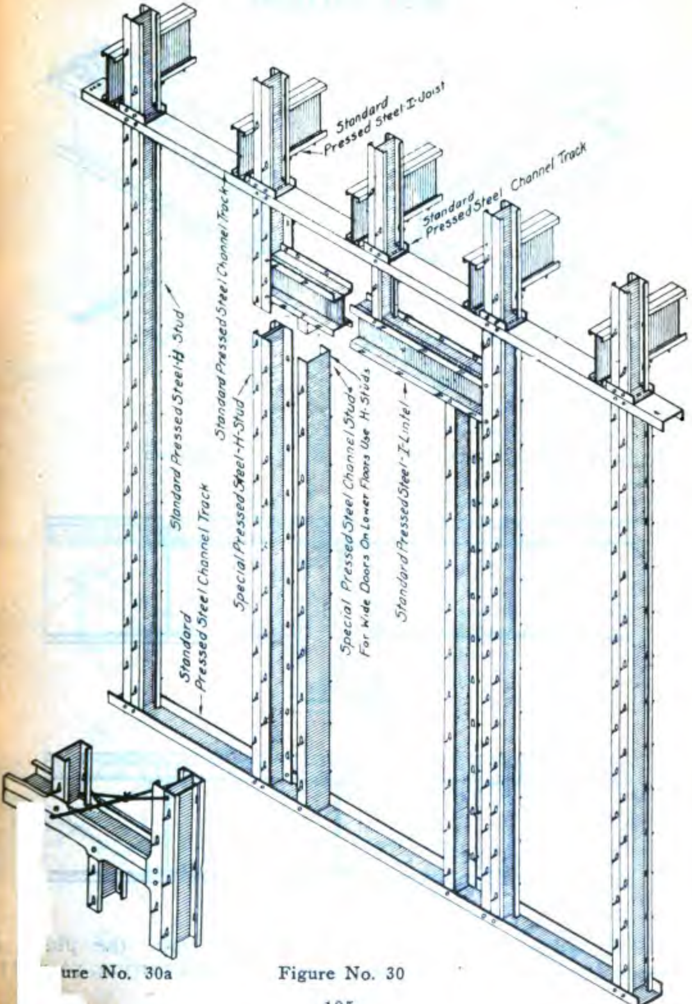
Figure No. 30 illustrates in detail the arrangement of members around wide door openings. The drawing is based on supporting partition construction, but the general plan is equally well adapted to non-supporting partitions.

The special lintel used for supporting partitions is correct in detail, is of great strength and well supported by both the end connection and the direct bearing on the inside studs. If the span of the lintel is long and several floors are supported above, H-studs should be substituted for the two inside channel studs. All studs and lintels in supporting partitions should be of .120″ or .072″ thickness, and all connections be securely bolted or riveted as shown, using 5/16-inch bolts or rivets.

Figure 30a illustrates a method of making field connections with standard I and channel studs. The center of the I-stud lintel should be reinforced with straps or 3/16-inch wire. Note framing details on page 97.

For non-supporting partitions the various members may be of 18 or 20 gauge, and standard "B" channel track may be substituted for the special "A" lintel. Details of non-supporting partitions are shown in later drawings.

DETAILS OF DESIGN



ure No. 30a

Figure No. 30

BERLOY METAL LUMBER

WALL ANCHORS

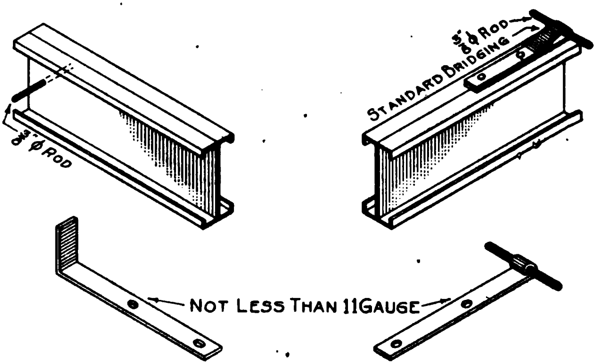


Figure No. 31

Typical wall anchors for use with Metal Lumber.

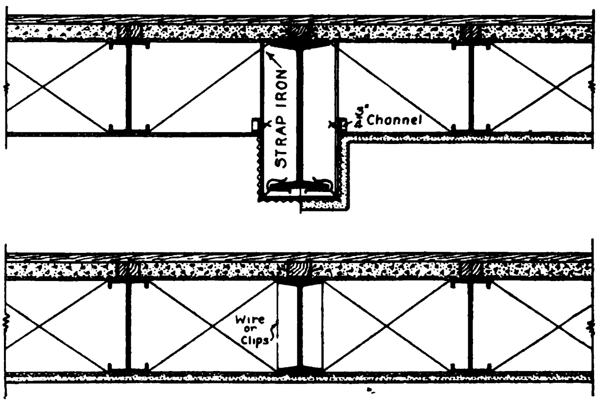


Figure No. 32

Details where structural beams and ties take the place o pressed steel joists. See general details of beam furring, pa 17

DETAILS OF DESIGN

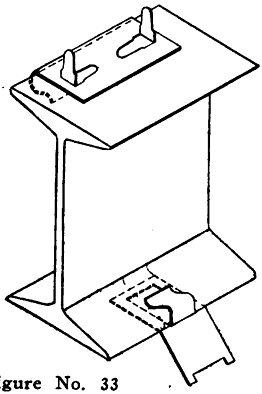


Figure No. 33

STANDARD PRONGED BEAM AND FURRING CLIPS

Pronged beam clips are used where joists rest on top of structural steel beams or channels, see page 86.

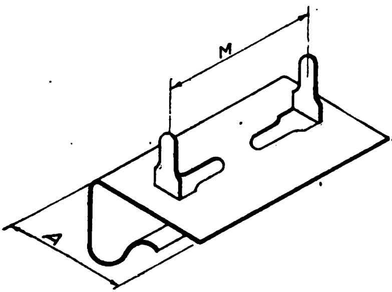


Figure No. 34

STANDARD PRONGED BEAM CLIP

Dimension "A" should be equal to ½ the width of flange of Beam for Joists butted, and to extend ½ inch over center of beam flange for Joists on one side of Beam only.

Dimension "M" equals width of Joist plus ¼ inch.

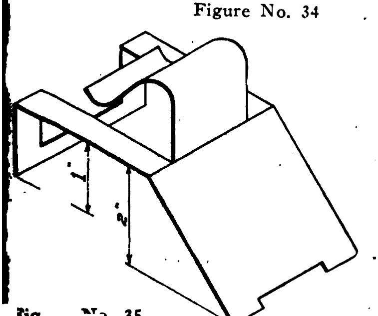


Figure No. 35

STANDARD FURRING CLIP

See detail of beam furring, page 117.

BERLOY METAL LUMBER

STANDARD SINGLE JOIST HANGERS

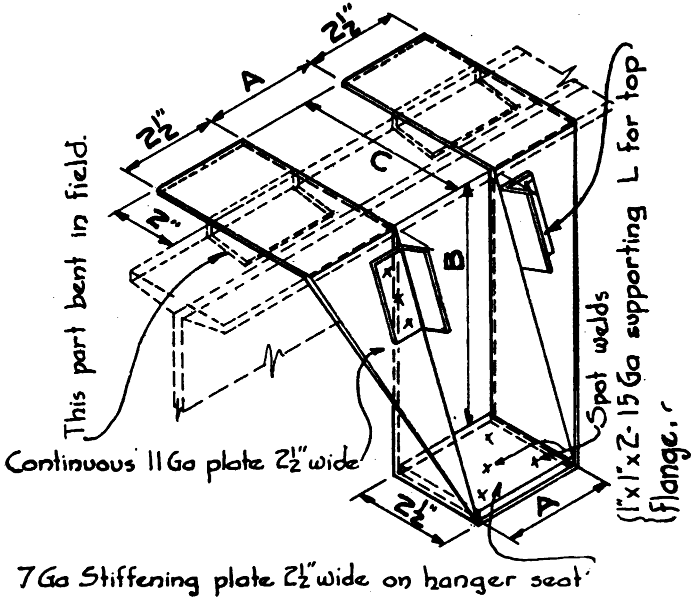


Figure No. 36

When ordering hangers give following dimensions:

A=Width of flange of joist plus ¼ inch clearance.

Note—If joists are not at right angles to supporting b   m, give angle joist makes with beam.

B=Distance from bottom of joist to top of beam.

C=2 inches plus flange width of supporting beam.

DETAILS OF DESIGN

STANDARD DOUBLE JOIST HANGERS

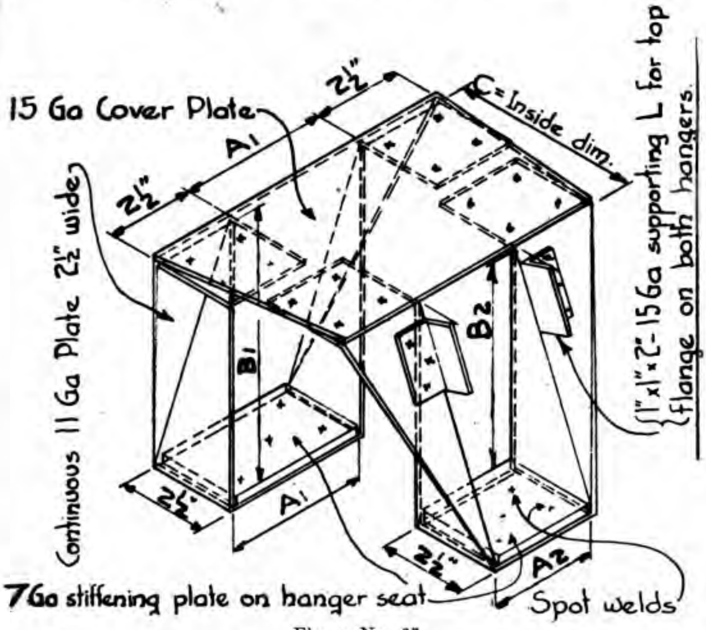


Figure No. 37

When ordering hangers give following dimensions:

A1=Width of flange of larger joist plus ¼-inch clearance.

A2=Width of flange of smaller joist plus ¼-inch clearance.

ote—If joists are not at right angles to beam, give the angle t joist makes with the supporting beam. If same joists are u :d on both sides of supporting beam, A1=A2 and B1=B2.

31=Distance from bottom of larger joist to top of beam.

32=Distance from bottom of smaller joist to top of beam.

=Flange width of supporting beam.

BERLOY METAL LUMBER

Bridging.—The purpose of bridging is threefold. First—it holds the joists in a vertical position. Second—it transfers concentrated loads which may occur to adjacent joists. Third—it also serves as a tie, securing the joist members together laterally. Various spans of joists should be bridged as follows: spans 12′ 0″ and under—1 row of cross bridging in center, spans 13′ 0″ to 17′ 0″—2 rows of cross bridging equally spaced, spans 18′ 0″ and over—3 rows of cross bridging equally spaced, but never more than 6′ 0″ between rows. The bridging is secured to the joists by nailing with 6d wire nails as described in details of erection.

BERLOY

DETAILS OF DESIGN

INSTALLATION OF PIPES, CONDUITS, ETC.

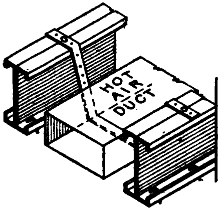


FIG.38-A

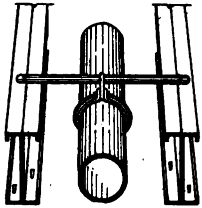


FIG.38-B

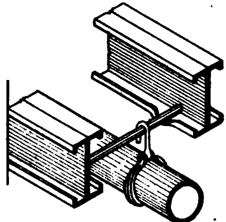


FIG.38-C

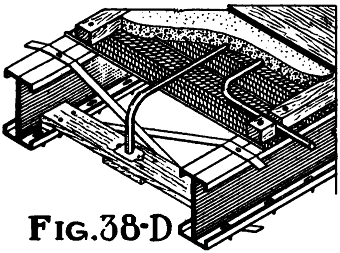


FIG.38-D

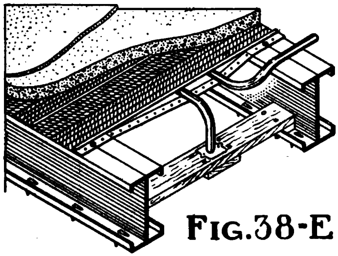


FIG.38-E

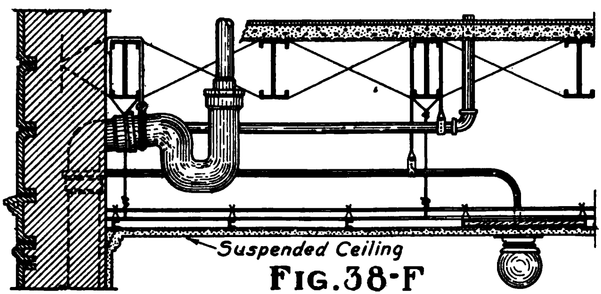


FIG.38-F

ipes and Conduits.—Where possible, piping and conduits sl uld be installed in a direction parallel to and between the jc ts, or they can be installed over the joists, and the nailing st ps (if used) notched, and the concrete fill poured around the cc luits or pipes. Suggestions are given in the above drawings.

BERLOY METAL LUMBER

STRENGTH OF CONCRETE SLABS ON METAL LUMBER FLOORS

The following table indicates the strength of the concrete slab used in connection with Berloy Metal Lumber floor construction.

Total safe loads in pounds per square foot on concrete slabs reinforced with ⅜-inch Berloy Ribplex and BB Lath, based on Berloy Pressed Steel Joist spacings as follows (see drawings, page 83):

Depth of Slab	Spacing on Centers in Inches					
	Slabs Reinforced with 25 Gauge B B Lath		Slabs Reinforced with ⅜ Inch Ribplex			
	12"	15¾"	19"		23½"	
			26 Ga.	24 Ga.	26 Ga.	24 Ga.
1½"	1178	684	232	307	151	200
2"	1595	927	314	414	205	269
2½"	2000	1160	394	520	257	338
3"	2430	1412	475	634	310	412

The shearing stresses produced by the above loadings vary from 7 to 37 pounds per square inch on the cover sectional area of the concrete slab.

BERLOY

DETAILS OF DESIGN

Detail showing method of securing lath and nailing strips to channels where they are used against walls.

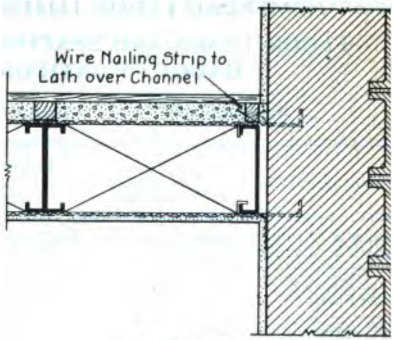


Figure No. 39

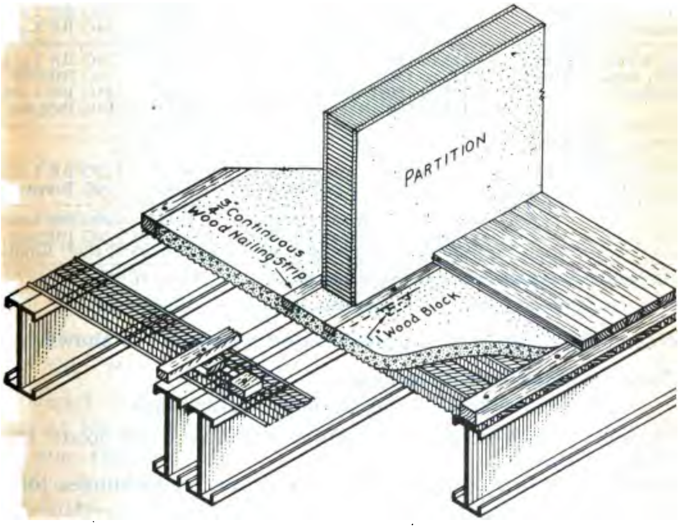


Figure No. 40

uggested detail where double joists occur under partition
ing method of nailing wood floors.

BERLOY METAL LUMBER

RECOMMENDED FLOOR LOADS AND JOIST SPACING

FLOOR LOADS AND SPACINGS OF JOISTS AND GAUGE OF LATH OR RIBPLEX

Recommended for floor and roof construction.

Nature of Floors	Live Loads in Lbs. Per Sq. Ft.	Proposed Floor Finish	Maximum Spacing of Joists	Gauge of Lath on Top of Joists
Garages & Auto Rep. Shop	125 to 150	Other than Wood	15¾"	24G BB Lath
Garages & Auto Rep. Shop	125 to 150	Wood	15¾"	25G BB Lath
Dance Floors	125 to 150	Wood	15¾"	25G BB Lath
Dance Floors	125 to 150	Double Wood	23½"	26G Ribplex
Auditoriums or Corridors				
(Spans 12′ 0″ to 14′ 0″)	80 to 125	Wood	23½"	26G Ribplex
(Spans 12′ 0″ to 14′ 0″)	80 to 125	Other than Wood	23½"	24G Ribplex
(Spans over 14′ 0″)	80 to 125	Wood	15¾"	25G BB Lath
(Spans over 14′ 0″)	80 to 125	Other than Wood	15¾"	24G BB Lath
First Floors of Store,	125 to 150	Wood	15¾"	25G BB Lath
Office, Bank or Hotel	125 to 150	Wood	19"	26G Ribplex
Buildings	125 to 150	Other than Wood	15¾"	25G BB Lath
	125 to 150	Other than Wood	19"	24G Ribplex
Floors of Light Load Requirements.				
(Best Construction)	50 to 80	Any Finish	15¾"	25G BB Lath
(Same Broader Spacing)	50 to 80	Any Finish	23½"	26G Ribplex
	30 to 50	Other than Wood	15¾"	25G BB Lath
Roofs	30 to 50	Other than Wood	19" or 23½"	26G Ribplex
	30 to 50	Other than Wood	24" to 48"	24G ¾" Ribplex

If movable non-supporting partitions, add 10 to 15 lbs. per sq. ft.

The wider spacing of joists is the more economical detail of construction.

Note: ⅜" Ribplex is intended except where ¾" is shown.

Recommended lath for ceilings:

Ribplex Lath and Diamond Mesh Lath

Standard or B. B. Diamond Mesh Lath on wood joists 13½ inches on centers.

Standard or B. B. Diamond Mesh Lath on metal lumber joists 15¾ inches on centers.

28-gauge ⅜-inch Ribplex Lath on wood or pressed steel joists 23½ inches on centers.

26-gauge ⅜-inch Ribplex Lath 27 inches on centers.

24-gauge ⅜-inch Ribplex Lath 31½ inches on centers.

DETAILS OF DESIGN

Notes on first table, page 114.

The floor finish is noted as "wood" or "other than wood" for the reason that floor finishes other than wood are subject to cracks from expansion or contraction; the concrete therefore must be more thoroughly reinforced to resist shearing and cracking tendencies. With a wood floor finish the concrete fill is merely a fire stop.

Where other than wood floors are used we recommend the use of cross reinforcing or temperature rods. These rods should run at right angles to the joists and if ¼ inch round should be spaced not over 24 inches on centers; if ⅜ inch round not over 30 to 36 inches on centers. The smaller rods at closer spacing are more effective. The rods should be installed in the upper half of the concrete slab.

When vibration is liable there should be a liberal use of bridging.

Concrete Fill Over Joists.—Portland Cement Concrete, the best fire-resistive material, is used only for fire-proofing purposes in this type of construction. The layer on top of the joists is poured between sleepers if finished wood floor is to be laid. If composition, tile or cement finish is desired the wooden sleepers are omitted, and the finish is applied on the unbroken concrete surface, except for standard expansion joints which should be cut to break up large areas.

The concrete likewise serves as an admirable stiffening member to the entire construction.

Plastered Ceilings.—A special series of tests has shown that the usual lime and gypsum mortars of good quality will afford protection against the passage of flame for a period of from forty-five minutes to one hour. Lime mortar is improved in fire-resistive qualities by the addition of from 25 to 30 per cent of Portland Cement.

I longer flame protection as well as resistance to the action of the hose stream is required, portland cement mortar as de-

BERLOY METAL LUMBER

scribed in the Metal Lumber specifications will be found adequate and economical.

The Completed Floor Structure.—The structure as a completed unit is one composed of materials proven best for the purpose for which they are used. Each material is complete in itself, and used *only* for the purpose for which it is best suited, as follows:

PRESSED STEEL, load carrying members.

RIBPLEX OR EXPANDED METAL, base for plaster, and centering and reinforcement for concrete.

CONCRETE, fireproofing and non-conductor.

CEMENT MORTAR, fireproof and waterproof ceiling.

FLOOR FINISH, any desired finish may be used to best suit the purpose to which the building is to be put.

FIREPROOFING MATERIALS, separate and distinct from structural members.

BERLOY RIBPLEX OR EXPANDED METAL LATH FOR FLOORS AND ROOFS

The function of this material, which is secured to the top and bottom of the joists, is the supporting and binding together of the fire protective portions of the construction.

In the concrete, which is placed over the joists, it acts as a centering as well as a reinforcing member.

In the ceiling, the lath acts as a base for plastering as well as a binder or mesh for the mortar when in place.

Repeated tests show that the lath is not in any way injured by the high temperature developed in mortar when directly attacked by flame for long periods.

Lath is secured in place on top of the joists by 1-inch roofing nails as described in "Details of Erection."

The diamond or ribbed metal lath when attached to the under side of the joists by means of prongs punched in the joists, serves as a base for the plastered ceiling of the room below.

This ceiling lath should extend at least 6 inches down on all walls and partitions to prevent cracks in the plastering in the corner.

DETAILS OF DESIGN

BEAM PROTECTION

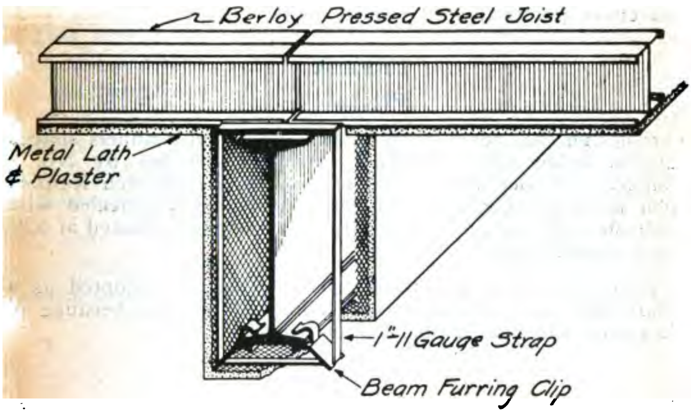


Figure No. 41
Standard Beam Furring

Beams or portions of beams projecting below the ceiling line must be protected from fire in fire-resistive construction.

Standard Berloy beam protection in connection with metal lumber floor construction is shown in figure No. 41. This construction is economical and effective. Furring clips and straps are spaced 15¾ inches on centers for diamond mesh lath and 24 inches on centers for ⅜-inch Ribplex. The lath or Ribplex is securely wired to the straps and plaster is applied of composition to afford protection for the period of time for which the building is rated.

See notes on plastered ceilings in Metal Lumber specifications.

See details of furring clips, page 107.

BERLOY METAL LUMBER

STANDARD SUSPENDED CEILINGS

A series of tests has clearly demonstrated that no one type of suspended ceiling construction could meet all conditions. As a result of the tests, we have selected these two types of ceiling which cover practically all requirements.

TYPE A

Fig. 42a

This design calls for ¾-inch 16 ga. cold rolled channels spaced as shown below and supported every 23½ inches by No. 7 galvanized, annealed wire hangers. No. 28 Ga.—⅜-inch Ribplex is then wired to channels with No. 16 galvanized annealed wire at each rib. The weight of this type of ceiling is estimated at 5.25 lbs. per square yard.

It is recommended that this type of ceiling be adopted as a standard and used wherever conditions will permit, because of its low cost and convenient design.

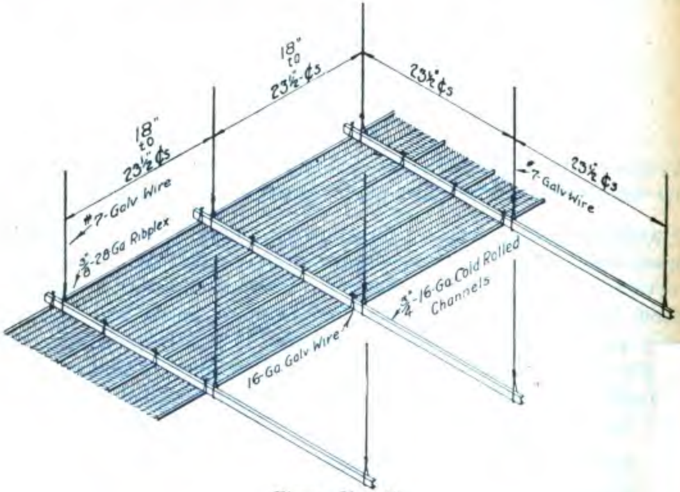


Figure No. 42a

DETAILS OF DESIGN

TYPE A-1

Fig. 42b

This design calls for 1½″—16 Ga. channels spaced 3′ 0″ on centers supported every 4′ 0″ by $\frac{3}{16}$-inch galv. wire hangers. ¾″—16 Ga. channels spaced 23½ inches on centers are to be fastened to the 1½-inch channels with No. 16 galv. annealed wire. Fasten ⅜″—28 Ga. Ribplex to the ¾-inch channels with No. 16 galv. annealed wire at each rib. The weight of this type of ceiling is estimated at 6¼ lbs. per square yard.

Where it is desired to use a heavy type of ceiling we recommend that this design be used, both on account of its stiffness and its carrying capacity.

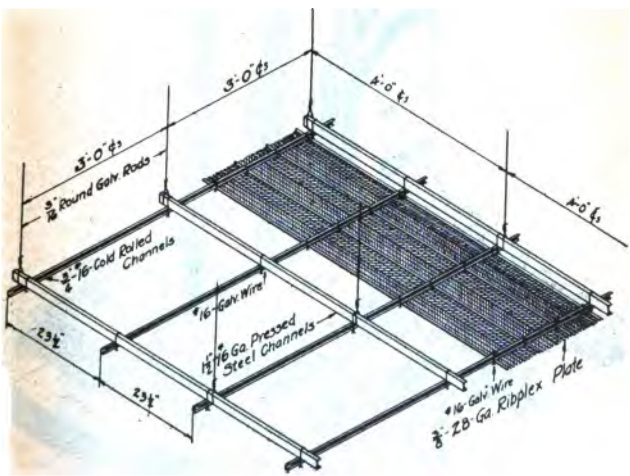


Figure No. 42b

BERLOY METAL LUMBER

PARTITIONS

Berloy Metal Lumber Partitions, built of metal studs and diamond mesh lath or Ribplex, plastered with cement, lime or gypsum mortar, form a light weight, economical fire-resistive construction.

These partitions are also sound, shrinkage and vermin proof, and easily and quickly erected.

The construction is well adapted to both interior and exterior supporting or non-supporting partitions.

Typical details of framing for doors in connection with Berloy Metal Stud partitions are shown in Fig. No. 30. This general arrangement of members about the door opening is adaptable to both supporting and non-supporting hollow partitions.

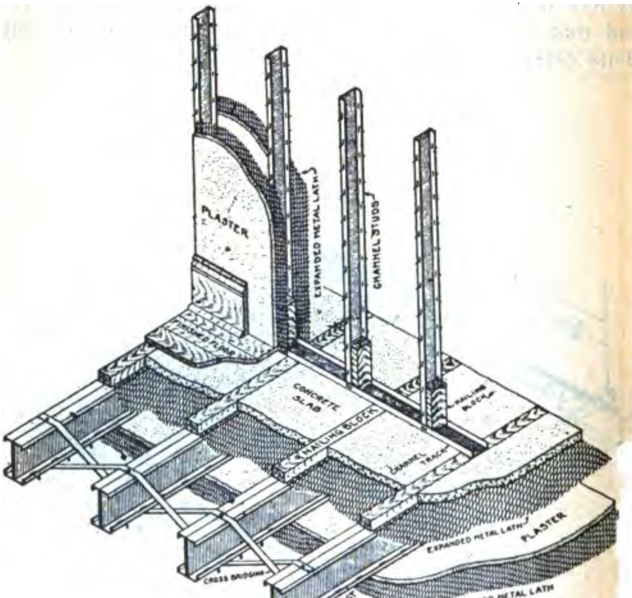


Figure No. 43

DETAILS OF DESIGN

Where it is probable that non-supporting partitions will be moved from time to time, the entire floor should be designed for 10 or 15 pounds extra load per square foot to enable it to support them wherever located.

Bearings for Partitions.—Supporting partitions should rest on walls, structural steel or reinforced concrete beams, or supporting partitions rather than on pressed steel joist floor construction. Supporting partitions should not be installed on pressed steel joist floor construction unless the partitions are not heavily loaded, and unless they cross the joists at right angles thereto. The joists in such cases should be designed to carry the full concentrated load of the partition at its point of bearing, as well as the uniform floor load on either side of the partition. The supporting partition studs should be located directly on the floor joists and be set in standard "A" channel track.

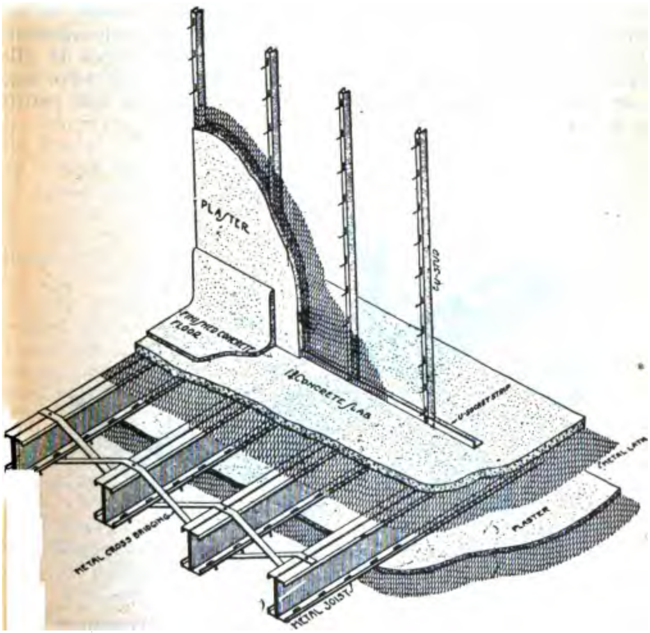


Figure No. 44

BERLOY METAL LUMBER

Standard "A" channel track should form the base for all supporting partitions. Joists should be secured to the track, and the track to its bearing, in each case by rivets or bolts.

Supporting partitions bearing on supporting partitions should be installed as shown in figures No. 10 and No. 30.

Non-supporting partitions are usually installed on the concrete fill, using standard "B" socket strips or metal lath track as shown in figures Nos. 43, 44 and 46. A double row of joists should be placed under non-supporting partitions when the partitions and joists run in the same direction.

If partitions are permanent of location and of heavy material, it will usually be found economical to use structural steel or reinforced concrete beams to support them. A beam to carry partitions formed as shown in figure No. 45, can be easily installed while the concrete fill is being poured, a board held up against the bottom of the joists by bracing from the floor below is all the centering which is required. A reinforcing rod or two located about 1 inch up from the bottom of the concrete will reinforce the beam.

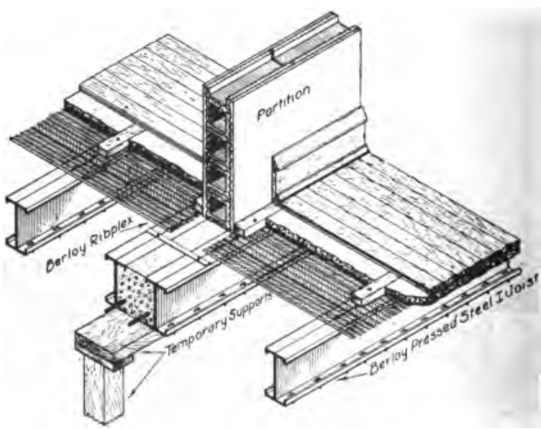


Figure No. 45

Isometric Drawing Showing Method of Supporting Permanent Heavy Non-Supporting Partition

DETAILS OF DESIGN

Supporting Partitions.—Berloy standard supporting partitions re composed of 4-inch H or channel studs; these can be varied n gauge, spacing and shape to meet the load requirements.

Partitions for the lower floors usually consist entirely of I-studs varying in gauge and spacing.

When loads become lighter channels may be substituted for art of the H-studs.

Channel studs should not be used exclusively in supporting artitions; at least every fourth or fifth stud should be of H secon to afford sufficient stiffness to the structure. H studs should ccur at the sides of door and window openings.

Tables of safe load carrying capacities of H and channel studs partitions are given on pages 76, 77 and 78.

The partition finishes about 1½ inches thicker than the width f the studs. For lath details see page 125.

Hollow Non-Supporting Partitions.—Hollow non-supporting artitions consist of 18 or 20 gauge "B" channel studs, stock idths up to 4 inches as described on page 49, but wider studs e furnished special upon order. Studs of 18 gauge should be ed for partitions over 10 feet high.

The partition finishes about 1½ inches thicker than the width f the studs. See figure 43, and lath details page 125.

Solid Non-Supporting Partitions.—Solid partitions consisting f diamond mesh lath or Ribplex base, and about 2 inches of laster, form a rigid, permanent and soundproof partition, ecoomical in cost and easily and quickly installed.

These solid partitions may be formed as follows:

"A"—¾" **Berloy Ribplex.**—Ribs should be placed vertically no studs required) and secured to the floor and ceiling by tandard track" for ¾-inch Ribplex as shown on page 49. (If e partition is curved, expanded metal track as shown on page 4, may be used.) The Ribplex is held in the groove of the hannel track at the ceiling line and secured to the angle track n the floor by bending the prong over the rib. If expanded etal track is used the Ribplex should be secured by wiring at oth floor and ceiling. For partitions up to 10 feet high use ¾-ch 26-gauge, for partitions 10 feet to 12 feet high use 24-gauge ibplex. Use 2" x 2" angles (18 ga.) from floor to ceiling at des of doors. Also similar angle lintels over top of doors.

"B"—**Studs and Lath or Ribplex.**—Solid partitions are also ormed of narrow cold rolled channels and a single layer of th or Ribplex attached thereto by wire. See figure 44, and age 125.

Th[illegible] partitions will finish approximately 2 inches thick.

BERLOY METAL LUMBER

Where curved or irregular partitions occur, either individual socket strips or field formed track of metal lath or expanded metal as shown in figure No. 46 may be used.

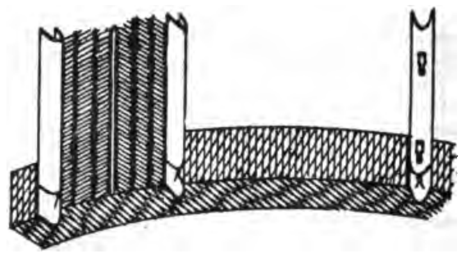


Figure No. 46

Partitions Enclosing Piping.

Double partitions enclosing piping, etc., may easily be formed of any desired thickness by the construction of two solid non-supporting partitions, one on either side of the pipes. One of the partitions being installed before the piping, and the other after the placing of the pipes.

Stock Material.

Materials for non-supporting partitions are furnished in stock lengths, and cutting is done and connections are made by the workmen on the job.

Adaptability.

The materials are adapted to practically any details desired, even though they may be intricate or highly ornamental. In fact Berloy "B" materials offer opportunities for an endless variety of practical and ornamental fire-resistive light weight structures.

DETAILS OF DESIGN

Partition Plastering.—Forty-five minutes to one hour protection against passage of flame will be afforded by good quality usual lime and gypsum mortars.

Lime mortar is improved in fire-resistive qualities by the addition of 25 to 30 per cent of portland cement.

If longer flame protection and resistance to the action of fire hose stream is required, portland cement mortar as described in the Metal Lumber specifications will be found adequate and economical.

The following tables give the spacing and size of studs required for various conditions:

Stud Spacing for Ribplex or Diamond Mesh Lath.—

For Standard or BB Diamond Mesh Lath, 16" on centers.
For ⅜" Ribplex Lath 28 Gauge, 23½" on centers.
For ⅜" Ribplex Lath 26 Gauge, 31½" on centers.
For ⅜" Ribplex Lath 24 Gauge, 35½" on centers.

We recommend the following sizes of cold rolled "C" channel studs for solid partition construction:

Spacing of Studs	Height in Feet	Size of C channels	
		Depth	Flange
13½" on centers	8 to 10	¾"	⅜"
	10 to 14	1"	⅜"
	15 to 18	1¼"	⅜"
	over 18	1½"	⅜"
15¾" on centers	8 to 10	¾"	⅜"
	10 to 14	1"	⅜"
	15 to 18	1¼"	⅜"
	over 18	1½"	⅜"
3½" on centers	8 to 10	¾"	⅜"
	10 to 14	1"	⅜"
	15 to 18	1½"	⅜"
	over 18	2"	⅜"
0" t 36" on centers	8 to 10	1"	⅜"
	10 to 14	1¼"	⅜"
	15 to 18	2"	⅜"
	over 18	2"	½"

BERLOY METAL LUMBER

DOOR JAMB DETAILS

These drawings suggest typical details of wood finish in connection with pressed steel and metal lath partition construction.

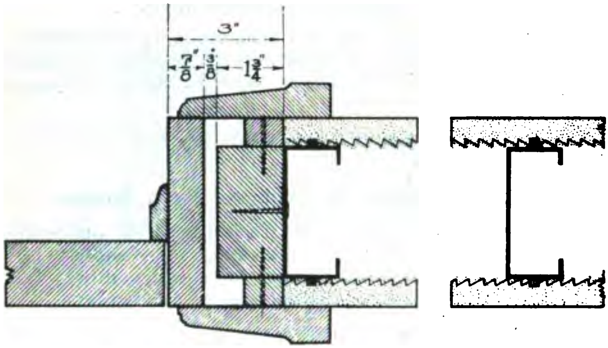


Figure No. 47

Detail showing construction of door jamb for Berloy Supporting Partition where Channel Studs are used at jamb

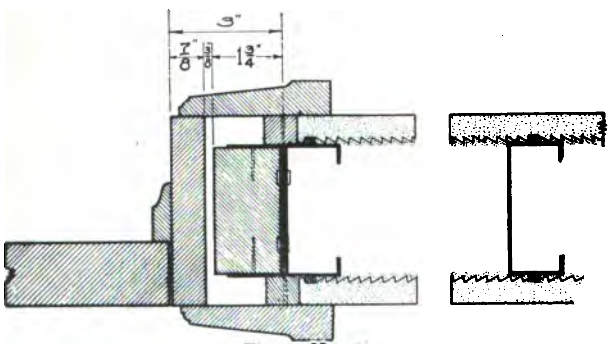


Figure No. 48

Detail showing construction of door jamb for Berloy Supporting [illegible]ition where H-Studs are used at jamb

DETAILS OF DESIGN

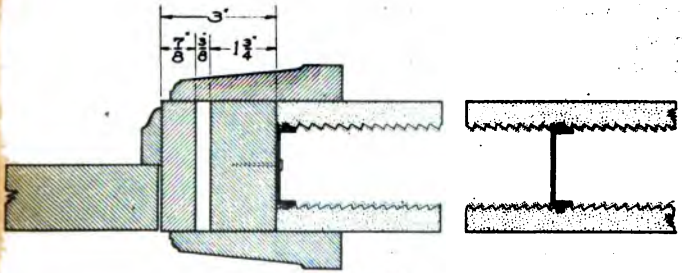


Figure No. 49

Detail showing construction of door jamb for Berloy Non-Supporting Channel Stud Partitions

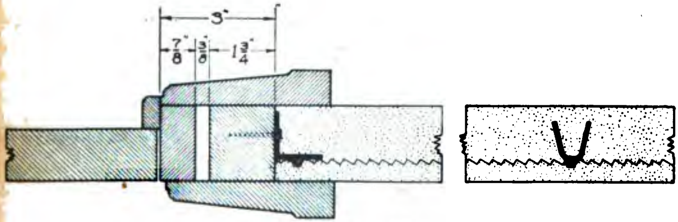


Figure No. 50

Det showing construction of door jamb for Berloy Non-Supporting U-Stud Partitions with Angle Stud used at jamb

BERLOY METAL LUMBER

CLAIMS

First in the field and therefore with broadest experience.

Economy:

In low cost of completed construction.

In light dead load on structure and foundations.

In time of erection and interest on money outlay during construction.

In cost of inspection.

Due to use of Standard Stock Materials.

In use of prepainted materials.

In elimination of forms and centering.

In resultant fire losses.

Easily and cheaply repaired after fire.

Easily and cheaply altered or repaired without loss of original strength.

Materials of Construction:

One man materials.

Steel of Standard analysis for building purposes.

Steel of structure least affected by very high temperature.

Materials used for purposes for which best adapted.

Materials positioned with least possible exposure to deleterious influences.

Design:

Ideal sections, both as to fire resistance and economy of materials.

Maximum portion of load carried by web of joists, which is least affected by high temperature.

Results in small concentrations of loading on the suppo ıg members.

Simple details and easy of installation.

Maximum flexibility and adaptability.

A complete system, including standardized connections, ıs, etc.

DETAILS OF DESIGN

CLAIMS

Erection:

- Can be installed any time in the year.
- Can be installed with ordinary hand tools, and without expensive apparatus, hoists, etc.
- Can be installed with a minimum amount of labor.
- Can be installed with unskilled labor.
- Materials are furnished cut to length, and detailed erection plans furnished.

Finished Structure:

- Fireproof.
- Soundproof.
- Vermin proof.
- Light weight construction for buildings with light live load requirements.
- Insures freedom from cracks and damaged decorations.
- Requires no expensive repairs.
- Eliminates the personal factor as to strength of structural members.
- Used in some 20 million dollars worth of buildings without a single failure.

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BERLOY

BERLOY METAL LUMBER

METAL LUMBER SPECIFICATIONS

General.—Where pressed steel construction is called for on plans and specifications, it means material equal to Berloy Metal Lumber manufactured by The Berger Manufacturing Company of Canton, Ohio.

Any system of pressed steel construction desired to be used as an equal to that specified above must be accompanied with a satisfactory official, authentic report of fire, load and water test, same having been made by competent, disinterested authorities.

Chemical Properties.—

The steel used in the manufacture of pressed steel joists and studs shall not contain more than .05% of phosphorus or sulphur, .35% to .50% manganese, and must show on chemical analysis .12% to .19% carbon.

Thickness of steel used in joists and studs in supporting partitions shall in no case be less than .072 inches and the lath not less than No. 28 U. S. Standard Ga. All steel entering into the manufacture of joists must show an ultimate tensile strength of not less than 55,000 to 65,000 lbs. per square inch of section; a percentage of elongation equal to 1,400,000 divided by the ultimate tensile strength.

Full facilities must be provided for inspector to make, or have made, such physical or chemical tests as in his judgment are necessary to determine the quality of material used as specified above.

All pressed steel furnished for floors and supporting partitions must be accompanied by erection drawings showing the location, size and character of the members to be used, the drawings tc e submitted to the architect for approval before the materia s fabricated.

All Metal Lumber pressed steel sections to be hand dippe n a special rust-resisting paint after forming and before shipm :. All expanded metal lath to be given one coat of hand dipped

SPECIFICATIONS

Floors.—Floors to be constructed of size and thickness of pressed steel I-joists as shown on drawings, spaced as indicated, and bridged laterally every one-third length of span with 1 inch No. 20 gauge galvanized bridging. This bridging to be secured by 6d nails driven into the webs of the joists.

On top of joists after bridging has been applied, attach Berloy Ribplex or Berloy Diamond Mesh Metal Lath, securing same by large head nails driven directly into web of joists. Ceiling lath to be applied to the bottom flange by means of prongs provided for the purpose, or wired through holes punched in the flanges of the joists. Directly on top of joists and parallel thereto apply 1¾ by 1¾-inch wood nailing strips, same being secured to joists by nailing directly thereto.

Concrete.—Top layer of lath to be covered with 1¾ inches of concrete, consisting of 1 part portland cement, 2½ parts sand and 5 parts broken stone, slag, or clean gravel—the maximum size of which will pass through a ¾-inch ring. This concrete to be applied comparatively dry and directly on top of the lath without forms, same being floated to an even surface.

Where floors are used requiring other than wood finished surface, eliminate the nailing strips, and apply 2 inches of concrete slab directly on top of the lath, consisting of 1 part portland cement, 2 parts sand and 4 parts gravel or broken stone. This slab to serve as a base for any finish floor which may be called for under other specifications.

Plaster.—For light structures requiring not over one hour protection as outlined in the "Standard specifications for fire tests of materials and construction" the usual lime mortar gauged 'th portland cement or gypsum plasters may be used.

For structures requiring over one hour protection under the ove noted regulations, portland cement mortar as per the folwing specifications shall be used.

Cement Plaster.—First coat—1 part portland cement plus 10% volume of hydrated lime, 3 parts by volume of sand based on

BERLOY METAL LUMBER

SPECIFICATIONS

the portland cement, with the addition of an ample quantity of hair. This coat upon completion to be well scratched in all directions with end of lath or other sharp instrument.

Second coat—If the first coat is applied in the morning the second coat should be applied in the afternoon. If the first coat is applied in the afternoon the second coat should be applied the following morning. The first coat shall be thoroughly wetted down. Proportions, 1 part portland cement plus 10% by volume of hydrated lime, 3 parts by volume of sand based on the portland cement. No hair to be added.

Third coat—After a period of setting, scratching and wetting down as above outlined a coat of 1 part portland cement and 3 parts of sand should be applied with a float finish. Or there may be substitued for this last portland cement and sand float finish coat, a smooth white coat of lime or gypsum and sand as may be desired.

The entire thickness of the plastering shall not be less than ⅞ of an inch.

Roof Construction.—The roof construction is to be the same as specified for the floors, using the 2-inch concrete slab on top of joists without nailing blocks. This slab to be left comparatively rough in order to thoroughly bond the waterproofing surface, which will be applied under another contract.

Suspended Ceiling.—Suspended ceilings are to be constructed of channels and Ribplex. The channels are suspended from the construction above by means of 3/16-inch round rods, securely fastened thereto.

Apply Ribplex to the under side of the channels by means of No. 16 gauge wire, bent in a manner that will hold the Ribplex securely.

Beam and Column Furring.—Beam and column furring to consist of 1-inch No. 11 gauge strap iron spaced 15¾ inches on centers and formed to suit the contour of the finished plastering. This strap iron to be spaced from the structural memb s by means of clips attached to the outer edges of the flanges f the beams or columns. The strap iron shall be covered v h ⅜-inch 28 gauge Ribplex or No. 25 gauge Diamond M h metal lath, secured to the straps by wiring with No. 16 ga e wire. Care to be exercised in forming the furring so that e and shape, when plastered, will conform to that shown in dr - ings.

SPECIFICATIONS

Supporting Partitions.—Where partitions are required to support floor loads, same are to consist of channel or H-stud sections of sufficient strength to carry, with a proper safety factor, the load of the floor supported thereby. Studs are to be spaced not over 16 inches to 24 inches, center to center, and secured to channel track and crowning members at floor and ceiling line with 5/16-inch diameter rivets, or bolts. In no case will other devices be permitted to serve as connections for the pressed steel construction.

The Ribplex or lath will be applied to the flanges of studs by the prongs punched thereon, or wired through holes punched in the flanges of the studs.

Where openings occur, such as doors and windows, same will be provided with special I-lintels of the proper size to carry superimposed loads which may come over these openings.

Partitions are to be erected in strict accordance with detailed erection drawings provided by the manufacturer and approved by the architect.

Non-supporting, Hollow Channel Stud Partitions.—Where partitions are shown hollow, with Ribplex or metal lath both sides of studs (the depth of studs being 2 inches or more), same are to consist of size of channels shown on plans, secured to both floor and ceiling by channel socket strips. 3/8-inch Ribplex or diamond mesh metal lath is secured to studs by means of prongs punched out for that purpose, the prongs being clinched over the metal lath.

Non-Supporting Solid Partitions.—The 2-inch partitions where noted on drawings, are composed of 1-inch No. 18 gauge U-studs, or 3/4 or 1-inch 16 gauge channel studs, spaced 13½ inches center to center, secured to both floor and ceiling by means of socket strips. No. 25 gauge BB diamond mesh metal lath is secured to studs on one side only by means of prongs punched out for that purpose if U-studs are used, prongs being clinched over the metal lath, or by wiring if channel studs are used.

Ribplex Partitions.—Berloy 3/8-inch Ribplex may be used instead of BB Lath by spacing the Studs 23½ inches on centers instead of 13½ inches on centers. In which case the rib side of the Ribplex shall be placed against the studs. Berloy 3/4-inch Ribplex may be used without the addition of studs, by erecting with ribs extending from floor to ceiling, in which case the ribs replace the studs. The top and bottom of the sheets shall be secured to the ceiling and floor with special track supplied for the purpose.

BERLOY METAL LUMBER

DEFLECTION

Any beam or joist placed on two supports in the manner usual in building construction will deflect somewhat even from its own weight, and this deflection will increase as additional weight is applied to the beam.

This deflection in the beam increases in direct proportion to the weight applied up to the point of its safe carrying capacity, therefore the amount of deflection can be determined for any loading which will not cause stress beyond the elastic limit of the material. The stress developed in the steel can also be determined based on any weight supported by the beam.

It has also been determined by repeated tests that plaster will crack when the deflection in the beam exceeds 1/360 of the span. As plaster ceilings are used in nearly all buildings, tables have been prepared which indicate the limitations of stresses in steel for various depths of beams and carrying capacities of beams of various lengths which will not cause a deflection of more than 1/360 of the span, or cause cracking in plaster ceilings.

All load tables published in this book are accompanied by notes which indicate whether the loads will produce excessive deflection or not.

The following tables on pages 135 and 136 may be used to determine the stress which may be developed in steel joists without causing undue deflection, as well as the deflection which will be caused by exceeding those limits, as follows:

Table, page 135, gives the maximum stress in steel hic may be used for beams of various depths which will not aus deflection exceeding 1/360 of the span.

Table, page 136, gives factors which may be used in ter mining the deflection which will occur when the steel ir oist is stressed beyond the limits noted in the preceding tab

DEFLECTION

TABLE OF ALLOWABLE UNIT FIBRE STRESSES FOR PRESSED STEEL JOISTS

Stresses given provide for deflection not exceeding 1/360 of span.

Depth of Beam	4"	5"	6"	7"	8"	9"	10"	11"	12"
CLEAR SPAN IN FEET									
9	14700								
10	13200	16000							
11	12000	15000							
12	11000	13725	16000						
13	9700	12650	15150						
14	9450	11750	14050	16000					
15	8800	11000	13150	15300					
16	8260	10300	12310	14350	16000				
17	7775	9690	11600	13500	15400				
18		9150	10950	12750	14550	16000			
19		8670	10350	12070	13750	15450			
20		8235	9850	11450	13100	14700	16000		
21		7895	9380	10900	12450	13950	15550		
22			8955	10430	11900	13400	14850	16000	
23			8565	9975	11400	12650	14200	15600	
24			8210	9560	10900	12250	13600	14930	16000
25						11750	13040	14340	15630
26						11290	12530	13780	15030
27						10910	12080	13280	14480
28							11640	12790	13950
29							11240	12360	13510
30							10870	11950	13030

BERLOY

BERLOY METAL LUMBER

COEFFICIENTS OF DEFLECTION, UNIFORMLY DISTRIBUTED LOADS

Span in Feet	Fibre Stress, Lbs. per Sq. Inch				Span in Feet	Fibre Stress, Lbs. per Sq. Inch			
	16000	15500	15000	14500		16000	15500	15000	14500
1	0.017	0.016	0.016	0.015	26	11.189	10.839	10.489	10.140
2	0.066	0.064	0.062	0.060	27	12.066	11.689	11.312	10.935
3	0.149	0.144	0.139	0.135	28	12.977	12.571	12.166	11.760
4	0.265	0.257	0.248	0.240	29	13.920	13.485	13.050	12.615
5	0.414	0.401	0.388	0.375	30	14.897	14.431	13.966	13.500
6	0.596	0.577	0.558	0.540	31	15.906	15.409	14.912	14.415
7	0.811	0.785	0.760	0.735	32	16.949	16.419	15.890	15.360
8	1.059	1.025	0.992	0.959	33	18.025	17.461	16.898	16.335
9	1.341	1.300	1.256	1.215	34	19.134	18.536	17.938	17.340
10	1.655	1.603	1.552	1.500	35	20.276	19.642	19.009	18.375
11	2.003	1.940	1.878	1.814	36	21.451	20.780	20.110	19.440
12	2.383	2.308	2.234	2.160	37	22.659	21.950	21.243	20.535
13	2.797	2.710	2.624	2.534	38	23.901	23.154	22.407	21.660
14	3.244	3.143	3.044	2.939	39	25.175	24.394	23.605	22.815
15	3.724	3.607	3.491	3.375	40	26.483	25.654	24.827	24.000
16	4.237	4.104	3.977	3.845	41	27.823	26.960	26.085	25.215
17	4.783	4.633	4.484	4.334	42	29.197	28.284	27.372	26.460
18	5.363	5.195	5.028	4.860	43	30.604	29.646	28.690	27.734
19	5.975	5.788	5.602	5.415	44	32.044	31.050	30.075	29.052
20	6.621	6.414	6.207	6.000	45	33.517	32.469	31.422	30.375
21	7.299	7.071	6.843	6.615	46	35.023	33.928	32.834	31.740
22	8.011	7.760	7.510	7.260	47	36.562	35.419	34.277	33.134
23	8.756	8.482	8.209	7.935	48	38.135	37.020	35.745	34.560
24	9.534	9.236	8.938	8.640	49	39.741	38.499	37.257	36.015
25	10.345	10.021	9.698	9.375	50	41.379	40.086	38.793	37.500

To find the deflection (D) in inches:

Sections symmetrical about neutral axis, $D = \dfrac{\text{coefficient}}{\text{depth in inches}}$

Sections not symmetrical about neutral axis, divide the coefficient given in tl... le corresponding to the given span and fibre stress by twice the distance of extrem... re stress from neutral axis, noted as X in tables of elements of sections.

ESTIMATING

ESTIMATING DATA

Joists.—The table of weights of steel per square foot based on I joists at various spacings on page 138, provides means for quick estimating of approximate tonnage of pressed steel joists involved in buildings.

In using the tables, it is merely necessary to ascertain the net floor area based on the size and spacing of the joists required; this, multiplied by the pounds of steel joists given per square foot, will give you the approximate tonnage for that section.

Small stairway, flue or vent openings should not be taken out of the measurement of the area of the room or panel because extra detailing work is required and this will absorb the charge for the material eliminated in the opening.

An extra should also be added for the substitution of .120 thickness joists where required at the sides of openings. Joists of .120 thickness should be used for all trimmers and headers. The tail joists are usually of the same size and of the same gauge as the balance of the panel.

If the greater part of the building has short spans and r merous laps and wall bearings, from 3 to 5 per cent s uld be added to the weights given.

f long spans prevail with few laps and wall bearings, t given weights may be discounted 2 or 3 per cent.

BERLOY METAL LUMBER

APPROXIMATE WEIGHTS OF I JOISTS I… …UNDS PER SQUARE FOOT OF FLOO…

Use net floor area in estimating—material for l… …d bearings are included in weights per square foot.

Use B. B. Lath for 12″ and 15¾″ spacing.

Use ⅜″ Ribplex for 19″ and 23½″ spacing.

For spacings over 24″ use ¾″ Ribplex.

Add cost of 50 lineal feet, or 7 lbs. of … …ng per 100 square feet of floor. For lath and Ribplex quantities… …net area plus 5%.

Revised—See page 23 of addenda.
138

		STANDARD SPACI… 12-15¾-19 AND 2… INCHES ON CE…					For Roof Construction Only. Using ¾″ Ribplex Based on Ribplex Sheets			
							9′-0″ Long	8′-0″ Long	10′-0″ Long	8′ & 12′ Long
		LINEAL FEET O… …T PER SQUARE FOOT OF AREA								
		1.08	.96	[illegible]	.69	.57	.50	.45	.37	.30
SPACING:		12″	13½″	[illegible]	19″ and 20″	23½″	26½″	31½″	39½″	47″
JOISTS										
4″	3.6 lb.	3.89	3.	.99	2.48	2.05	1.80	1.62	1.33	1.08
5″	4.1 lb.	4.43	[illegible]	3.40	2.83	2.34	2.05	1.85	1.52	1.23
6″	4.6 lb.	4.97	[illegible]	3.82	3.18	2.62	2.30	2.07	1.71	1.38
7″	5.3 lb.	5.7	9	4.40	3.66	3.02	2.65	2.39	1.96	1.59
8″	6.0 lb.	6	.76	4.98	4.14	3.42	3.00	2.70	2.22	1.80
9″	8.3 lb.	[illegible]	7.97	6.89	5.73	4.73	4.15	3.74	3.07	2.49
	6.7 lb	[illegible]	6.43	5.56	4.62	3.82	3.35	3.02	2.48	2.01
10″	9.5	26	9.12	7.89	6.55	5.42	4.75	4.28	3.52	2.85
	7	8.00	7.10	6.15	5.11	4.22	3.70	3.33	2.74	2.22
11″	[illegible]	12.96	11.52	9.96	8.28	6.84	6.00	5.40	4.44	[illegible]
	b.	8.53	7.58	6.56	5.45	4.50	3.95	3.56	2.92	[illegible]
12	lb.	13.72	12.19	10.54	8.76	7.24	6.35	5.72	4.70	[illegible]
	.4 lb.	9.08	8.06	6.97	5.80	4.79	4.20	3.78	3.11	[illegible]

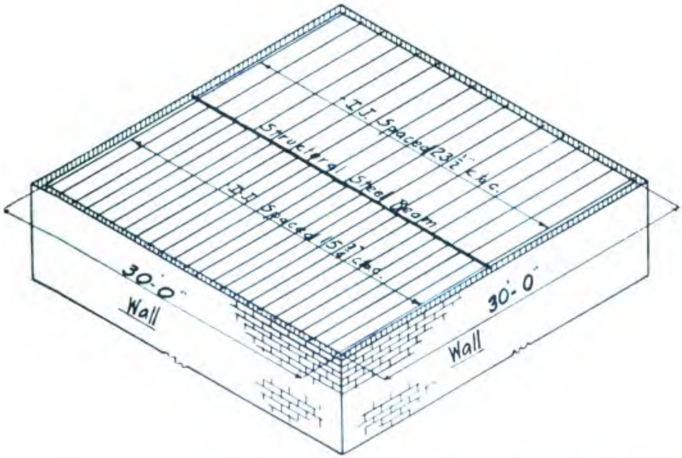
…nts given above are approximate for short cut estimating and checking.

ESTIMATING

If joists are omitted at the sides of beams and along faces of walls, make proper deductions based on their length and weight.

If partitions run at right angles to the joists consideration should be given the question of supplying joists sufficiently strong to support the concentrated, as well as the distributed floor load. Double joists should be installed under all partitions running parallel to the joists, and cost of such extra joists must be added to your estimate.

The tables above referred to are worked up on the following basis: Assumed a section of floor 30 feet square as illustrated in figure No. 51. The joist lengths being 15′ 9″ long for each half, providing for 6-inch wall bearing and 3-inch lap on center beam, and assuming all joists of the same gauge.



Isometric Plan showing 30×30 section of floor

Figure No. 51

BERLOY METAL LUMBER

Thickness, size and length differentials must be made use of in pricing material.

Shape differentials, special fabrication and punching charges are given for special conditions and the table of weights given do not cover any such conditions.

Bridging.—Add the cost of 50 lineal feet or 7 pounds of bridging per 100 square feet of floor area.

Lath or Ribplex.—The net floor areas previously referred to may be used for estimating the lath or Ribplex required, but 5 per cent should be added to the net areas to care for a 6-inch turn down of ceiling lath on all walls and for laps.

The approximate number of pounds of studs in partitions may be quickly determined by assuming the use of 10 lineal feet of studs and track per square yard of partition when studs are spaced at 15¾ inches on centers, or assuming about 7 lineal feet of studs and track per square yard of partition where studs are spaced at 23½ inches on centers.

Lath should be figured for full gross area of partition, including doors or windows, except possibly allowing 50% of the area of double doors or double windows. There should then be added to the total area about 5 per cent extra lath for waste and laps.

It is important to remember that double the area of lath is required for hollow partitions.

Very high or unusually low partitions should be estimated in detail.

The cost of erection of metal lumber floor construction incl -ing hoisting and placing of joists, nailing bridging, nailing l h to top of joists, and securing the lath to the bottom of the jo s should not exceed 3 to 4 cents per square foot for an aver e job.

DETAILS OF ERECTION

(First read the chapter on details of design.)

Steel Frame.—If the joists rest on top of the beams, secure them with pronged beam clips which are driven on the beam flanges (see page 107), the prongs are bent down over the joist flanges. If joists rest on shelf angles these clips are not required. Space the joists at the ends as they are placed, joists should bear at least 2½ inches in the steel as shown in figures No. 7 and 8.

Secure the joists temporarily in place by nailing a light wooden strip along the tops of the joists near the supports, driving the nails through the strips down between the two channel sections of the joists. The use of these strips is shown in the foreground of illustration No. 52.

Figure No. 52
Showing Metal Lumber Floor Construction with Joists Temporarily Secured with Light Wood Strips

Гhe Bridging is then installed as described under "Bridging" er which the temporary wood strips may be removed.

3raced Joists.—To aid in the erection of joists of long span the rloy method of bracing as illustrated in figure No. 53 should used. Two joists are designed to be bolted together at the ırter points of the span to form a braced truss or backbone the installation of the joists in the entire panel. The joists

BERLOY METAL LUMBER

should be bolted together and then installed in the center of panels where the span of the joists is over 16 feet. The adjoining joists in the panel are then installed and attached to the braced couple by means of the temporary wooden strips above described. Joists with holes properly punched and bolts are furnished for these braced pairs with orders for Berloy Metal Lumber. The joists and bolts are wired together, and the bolts are threaded to care for spacing of joists from 12 to 24 inches on centers.

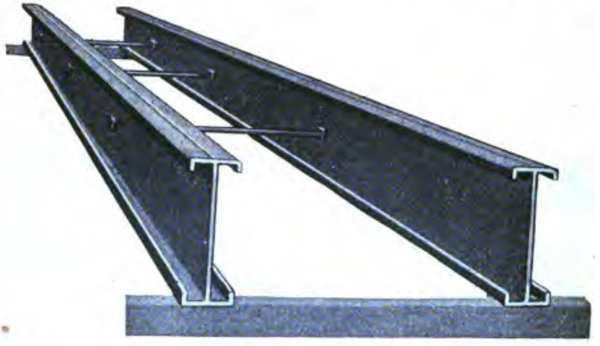


Figure No. 53

Brick Wall Bearing.—The above described method of temporarily securing the joists in position with wood strips is advisable when the walls are not built up to the tops of the joists as they are installed.

Joists should bear from 4 to 6 inches on walls as shown in figure No. 17. The bridging should be nailed in place as soon as the joists are installed.

Berloy Hangers.—When Berloy Hangers are used the hangers should first be properly spaced to receive the joists. In case of single hangers, the projecting arm extending over the oppos side of the beam should first be bent down over the edge a then up under the top flange of the steel beam. See figures I 9 a and b. The joists are then dropped into place in the hang

As the joists are supported laterally, the temporary wood strips need not be used, but the cross bridging should be stalled promptly.

DETAILS OF ERECTION

Concrete Beams.—The details of design referring to joists inserted in concrete beams should be carefully read, and the plans followed closely in this type of construction.

If the joists bear in the web of the beam particular care must be taken to insure at least 2-inch bearing in the web in the case of each joist. If the joists are held by the flange or plate of the concrete tee beam, all details involved in placing the reinforcing rods and the joists must be faithfully carried out.

In either of the above cases the joists are usually placed on top of the board forming the under side of the top flange of the concrete tee beam. If they enter the beam 2 or 3 inches above this level, a strip of the proper height can first be nailed along the outside edge of the board forming the bottom of the flange, and the joists placed on the strip.

The short boards forming the sides of the concrete tee beam between the joists are then installed vertically between the joists, and act as spacers and lateral supports for the joists as well as the sides of the beam form.

See figures No. 11, 12, 13, 14 and 15, pages 88-91.

The cross bridging should be installed promptly after the concrete has set.

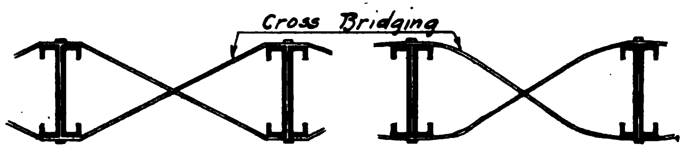
Tile Beam Protection.—Install the joists as above described for bearing on shelf angles or on brick walls.

Framing Around Openings.—Details of methods of framing around openings are given in the description of figures No. 19, 20, 21 and 22, pages 96-98.

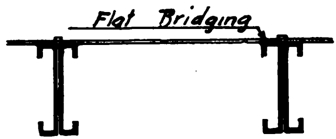
Bridging.—Install bridging as shown in figures No. 43 and 54, nailing to the tops of the joist only when placing in position. Then when the scaffolding for plastering is erected, and before the lath is installed, pull the bridging sidewise under the joists until taut, and then drive nails through it and up into the bottom of the metal joists, the nails again being driven between the two annels forming the joists. It is important that the completed dging be taut. A single line of flat bridging should be inlled on top of the joists about 12 inches away from the surrts on all joists unless their ends are bricked into a wall or cased in concrete when installed.

The sizes of nails suggested and illustrations of the method of ling the bridging, lath and wood sleepers are shown in figure 55.

BERLOY METAL LUMBER



The Right Way The Wrong Way



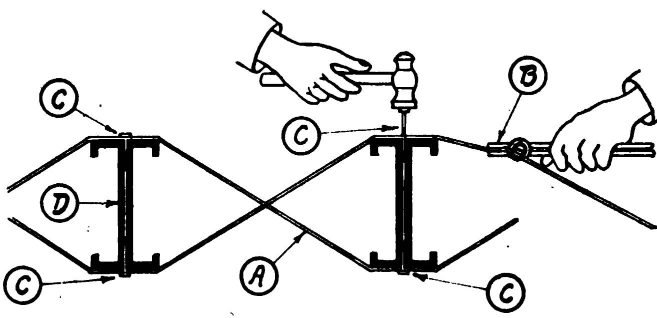


Figure No. 54

(A) Metal Cross Bridging 1″ wide made of 20-gauge galv. steel.

(B) Flat-nosed pincher used to pull Bridging taut.

(C) 6d nail for nailing Bridging into webs of I-Joists.

(D) Metal I-Joists.

DETAILS OF ERECTION

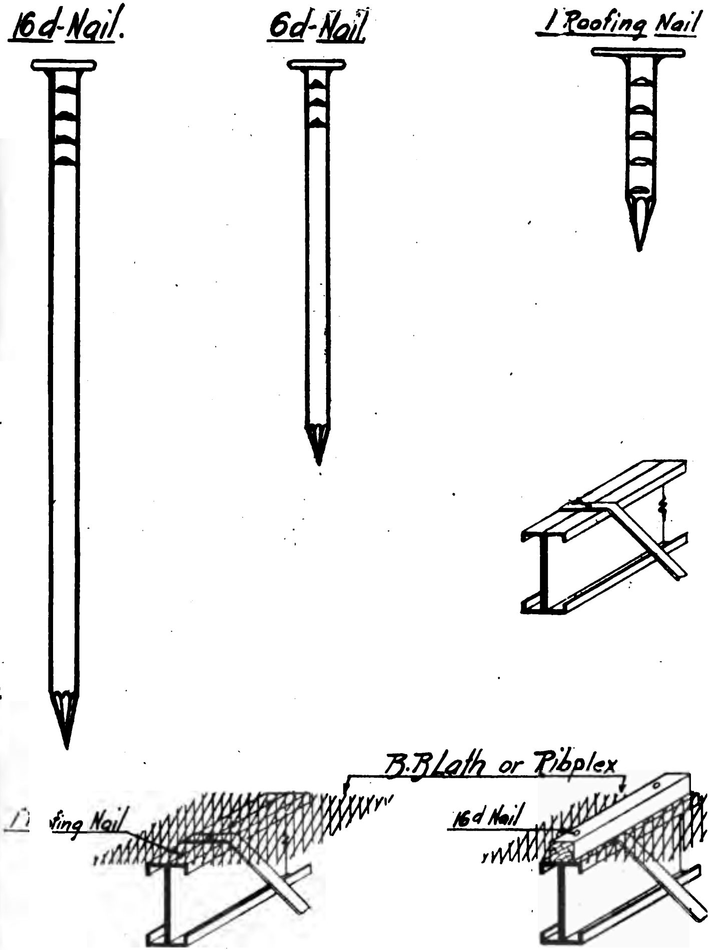


Figure No. 55

BERLOY METAL LUMBER

Ribplex on Top of Joists.—Install the layer of Ribplex on top of the joists with the ribs up, by nailing with 1-inch roofing nails driven downward between the two channels forming the I joists. The sheets of Ribplex or lath should lap on top of the joists, each sheet extending at least one inch beyond the center of the joists. If laps occur between the joists, sheets of Ribplex or lath should lap at least 6 or 8 inches, and the sheets be securely wired together.

Concrete over Joists.—After nailing strips are installed, cover the Ribplex or lath between strips with 1¾ or 2 inches of concrete or other fill as specified. If concrete, use not over ¾-inch stone or gravel and comparatively dry mix. If nailing strips not required fill between temporary screeds nailed to every third or fourth joist.

Figure No. 56

Ribplex or Lath Ceiling.—When ready for plastering, the Ribplex or lath is attached to the under side of the joists, lath side down, by means of prongs punched from the lower flanges of the joists or wired with 16 gauge wire through holes punched in the lower flanges for the purpose. Where there are prongs, the mesh is pushed up over the prong, and the prong is then bent back over the lath by the blow of a hammer.

The ceiling lath should be turned down 6 inches on all walls and partitions to avoid cracks in the plastering at the junc[illegible] of the walls and ceilings.

Beam Protection.—Beam furring is installed after the [illegible]sts are in place, as shown on pages 107 and 117. This furring co[illegible]sts of standard furring clips which are driven over the edge[illegible] the

DETAILS OF ERECTION

lower flange of the beams, and 1-inch No. 11 gauge strap iron strips formed to the size and shape required are secured in place by wiring and covered with Berloy Ribplex or expanded metal lath which is in turn wired to the strap iron and ceiling lath.

Bearing Partitions.—First secure the track which is designed to act as a base and crown for the studs; by bolting to masonry, securing by straps to structural steel, or by bolting or riveting to the flanges of metal lumber joists as shown in figure 30. Where studs occur, both below and above the track, the track should be inverted (with the flanges down), and short pieces of track riveted or bolted to the upper side of the continuous track to receive the upper tier of studs. The floor joists can then rest on the upper or flat side of the continuous track close to the upper studs. Or if desired a double continuous line of track can be installed and a course of brick laid in the upper track between the studs to afford a solid bearing for the floor or roof joists.

Where metal lumber bearing partitions are used the floor or roof joists are placed at one side of and close to the studs, and the lower flanges are riveted or bolted securely to the track. In this way the load bearing studs are provided with direct and solid bearings at the various floor levels, and the joists have a firm bearing, resulting in a strong and well-braced structure.

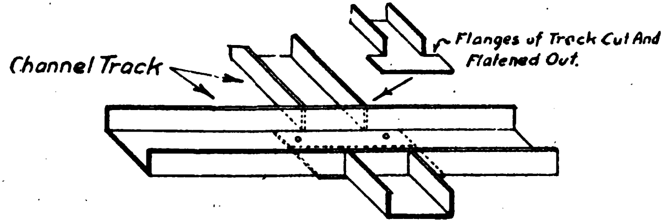
Doorway Construction.—Figure No. 30 shows typical details of framing around a door. This method provides both an end connection and a direct bearing for the lintel, insuring the full carrying capacity of the lintel and permitting ease in locating the door in its proper position. Rivets or bolts should be used for all connections.

Non-bearing Partitions.—Double partitions consist of 18 or 20 gauge "B" channel studs, stock widths up to 4 inches as described on page 49 (wider studs are furnished upon special order). Berloy diamond mesh lath or Ribplex is attached to the prongs on both sides of the studs.

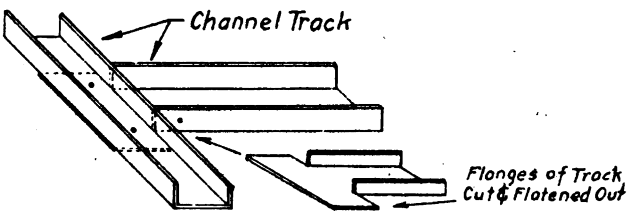
Spacing of studs for various types of lath, etc., to be as described on page 125.

The manner of cutting and connecting sections of track at corners of partitions, etc., is shown in figure No. 57.

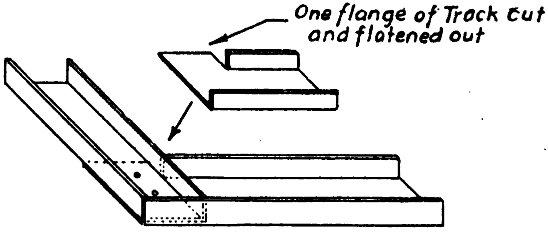
Details Showing Way to Cut Track so That One Partition May be Tied to Another. Track at Ceiling to be Same as at Floor



Detail showing method used to connect track where two partitions frame into another.



Detail showing method used to connect Track where one partition frames into another.



Detail showing method used to connect Track whe one partition frames into another at corner.

Figure No. 57

DETAILS OF ERECTION

Door and window lintels are usually formed of standard track, cut and installed on the job, along the lines similar to that shown in figure No. 58. The type of construction shown in figure No. 30, may be used with very long lintels or for lintels where unusual strength is desired.

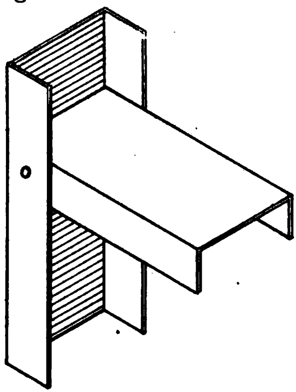


Figure No. 58

Solid Partitions.—Standard track is first secured in place on the ceiling and floor conforming to the location of the partitions. Or holes properly spaced to receive the studs are driven in the ceiling and floors on the lines of the partitions.

The Berloy C channels or U studs are then installed vertically and the lath secured thereto.

The lath is wired to the "C" channels with 16 gauge wire, or secured to the prongs on the U studs. These prongs are punched for this purpose.

Where ¾-inch Ribplex partitions are used the Berloy special channel ceiling track and angle floor track should be used. The Ribplex is first pushed up in the channel ceiling track and then pushed over the prongs which are provided in the angle floor track, the prongs are then bent back over the rib securing the ribplex sheets in place.

Temporary bracing as shown in drawing No. 59 should be used in connection with light non-supporting studs and ¾-inch Ribplex partition construction where necessary to provide a firm base for the first coat of plaster, after which the braces will not be required.

BERLOY METAL LUMBER

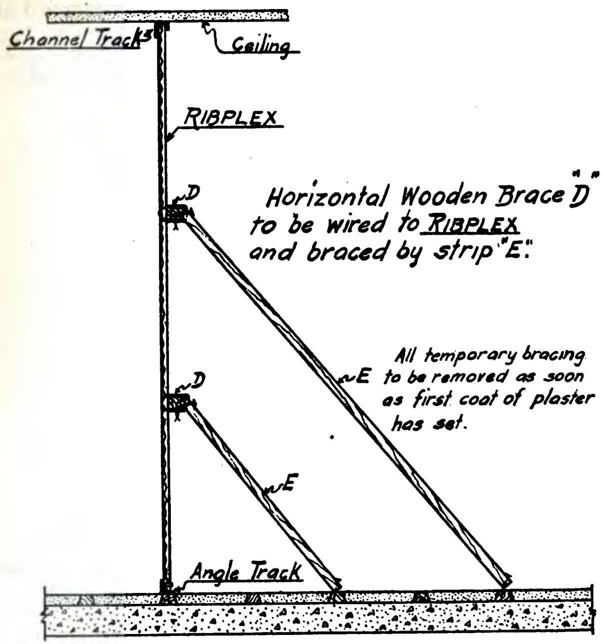
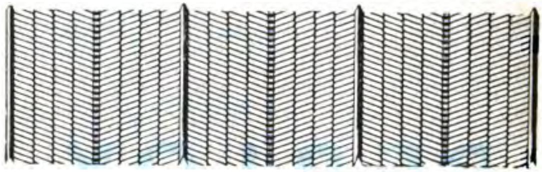


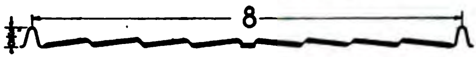
Figure No. 59

The chapter on "Details of Design" should also be read in connection with the question of proper erection of pressed steel sections, as the reasons for the regulations given are there noted and also further descriptions of the following subjects:

BERLOY THREE-EIGHTHS INCH RIBPLEX LATH



Section across ⅜" Ribplex sheet. Covering width 24". Length 96".
Gauges 24, 26 and 28.
Code words: 28 Ga., zesno; 26 Ga., zeson; 24 Ga., zesra.
Shipped only in bundles of nine sheets, each bundle containing 16 sq. yds.
Weight per sq. yd.—28 Ga. 2.55 lbs., 26 Ga. 3.06 lbs., 24 Ga. 4.08 lbs.
Made of black or galvanized steel in all three gauges.
Also made of Toncan Metal in 24 and 26 gauges.



Cross Section to Show Relation Between Ribs and Mesh

Berloy ⅜-inch Ribplex is a self-furring expanded metal lath. Its extreme rigidity, due to the ⅜-inch Ribs, permits wide spacing of studs and ceiling supports. This saves material and erection costs.

Used principally for partition and ceiling plaster work, for exterior stucco and for overcoating old buildings. *In all cases place the ribs against and the mesh away from the supports.*

Ribs Against Supports

The Inside Key

BERLOY THREE-EIGHTHS INCH RIBPLEX LATH

Three-eighths-inch Ribplex Lath construction is fire resistive and practically removes the possibility of cracks in plaster.

The flattened strands—a recent improvement—decrease the size of the openings and give a perfect key with a minimum amount of plaster.

The ribs nest together at sides and ends to make a rigid splice and a uniform plastering surface.

Twenty-four inches is the effective covering width. No waste of material for side laps.

The stiff sheets are convenient to handle and easy to erect. There are no sharp cutting edges. Sheets are true to size—ends are resquared after forming.

The ribs take the place of furring strips, a saving of material and time of erection.

Cost is practically the same as for Diamond Mesh Metal Lath of similar weight.

With ⅜" Ribplex Lath the finished work is strong, firm, uniform, permanent and satisfactory.

SPECIFICATIONS FOR ERECTING ⅜" RIBPLEX LATH

In all cases place the ribs against and the mesh away from the supports.

Place the ribs at right angles to supports.

All adjoining sheets are to be interlocked at sides and ends.

Sheets shall be securely wired together with No. 18 gauge wire every 24 inches along the ribs at sides and every 4 inches at ends.

⅜" Ribplex Lath shall be securely wired to channels with No. 18 ga. wire or stapled to studs with 1¼" No. 14 Ga. wire staples at least every 8 in.

When splices are necessary between supports such splices shall be at least 2 ft. apart in adjacent rows.

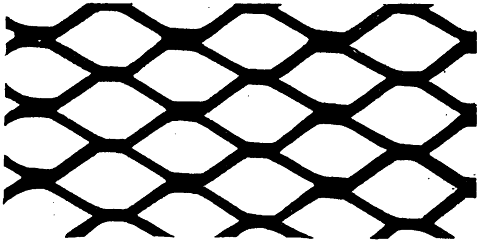
Allow two inches end lap when splices are at supports—If splices are between supports allow 8 inches.

The spacing of supports for ⅜" Ribplex shall be according to the following table unless other conditions make closer spacing advisable.

Gauge of Ribplex	Stud Spacing for Walls and Partitions (Maximum)	Spacing of Supports for Ceilings (Maximum)
8	23½"	23½"
	31½"	27"
	35½"	31½"

BERLOY DIAMOND MESH LATH

B. B. (BERLOY BEST) LATH



Showing Full Size of Mesh

Here is another member of the Berloy Lath Family. B. B. Lath is expanded into small, diamond-shaped meshes. This size mesh does not "eat up" the plaster, and it provides an excellent reinforcement.

Because of its forming qualities, we recommend B. B. Lath for all work where bending is required. Use it for corners, for coves, for ornamental furring of any description—use ⅜-inch Ribplex for the straight-away work and you have the ideal combination.

B. B. Lath is made from open hearth steel in gauges 24, 25, 26 and 27, painted after forming with black graphite paint or in 24 and 26 gauges cut from galvanized sheets. It is also made of Toncan Metal in 24 and 26 gauges painted red to distinguish it as Toncan.

Unless otherwise specified the sheets are shipped 24"x96" in size. Sheets 18"x96" can also be furnished.

B. B. Lath is shipped in bundles of 9 sheets. We do not break bundles.

Following table refers to B. B. Lath.

Gauge	Weight Per Sq. Yd. Steel or Toncan Painted	Weight Per Sq. Yd. Cut from Galvanized Sheets	Square Yards Per Bundle 24" x 96"	Square Yards Per Bundle 18" x 96"
27	2.33 lbs.*		16	12
26	2.50 lbs.	2.90 lbs.	16	12
25	3.00 lbs.		16	12
24	3.40 lbs.	3.50 lbs.	16	12

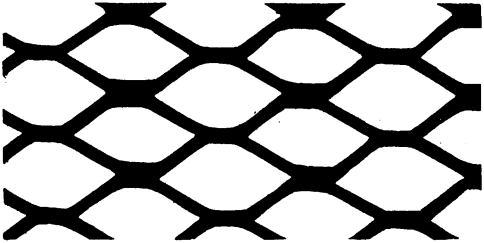
* Toncan lath not made in 27 gauge.

Code words, painted steel lath:

27 Ga.	zetal	26 Ga.	zetem
25 Ga.	zetla	24 Ga.	zetme

BERLOY DIAMOND MESH LATH

STANDARD LATH



Actual Size of Mesh

This is an expanded metal lath with a mesh slightly larger than B. B. Lath, with a greater covering width per pound and a slightly lower cost per square yard.

It is made of Toncan Metal and painted red or of open hearth steel and painted black or is cut from galvanized open hearth steel sheets. All three forms are made in 24 and 26 gauges. It is shipped 9 sheets to the bundle and we do not break bundles. Here are the figures.

Gauge	Weight Per Sq. Yd. Steel or Toncan Painted	Weight Per Sq. Yd. Cut from Galvanized Sheets	Size of Sheets	Square Yards Per Bundle
26	2.2 lbs.	2.40 lbs.	21″x96″	14
24	2.8 lbs.	2.85 lbs.	22″x96″	14⅝

Code words, painted steel lath:
26 G zetop 24 G zetpo

BERLOY POST OFFICE LATH

T'is is a diamond mesh expanded metal lath, made in accordanc with the specifications of the United States Government.

I is made only in 22 ga. either from steel or Toncan Metal. anc weighs 4.33 lbs. a square yard or 4.75 lbs. a square yard wh cut from galvanized sheets.

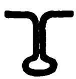
1 ere are nine sheets 18″ x 96″ in a bundle, or 12 square yards. We not break bundles.

BERLOY CORNER BEADS

Rail Bead

Wing Bead

BERLOY RAIL BEAD



This is for corners subjected to especially rough usage. It is made of 22 gauge galvanized metal. One clip is supplied for each lineal foot. It is made in stock lengths of 6, 7, 8, 9, 10 and 12 ft. and shipped in bundles of 25 pieces—weight per 1,000 feet, 167 lbs.; including weight of clips.

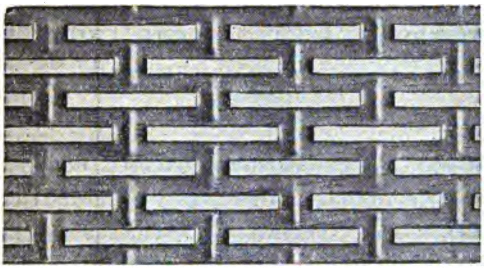
BERLOY WING BEAD

This is one of the most rigid corner beads of the Wing type. It is very easy to erect and gives a perfect angle. Made in stock lengths of 6, 7, 8, 9, 10 and 12 ft. of 26 gauge galvanized metal and shipped in bundles of 10 pieces. Weight per 1,000 feet, 165 lbs.

Clips are not necessary with Wing bead, but can be supplied if desired.

BERLOY SHEET LATH AND WALL TIES

BERLOY LATTICE SHEET LATH



This type of lath is preferred by some builders. It is a perforated sheet, not expanded. Berloy Lattice Lath is very rigid and gives a positive clinch. Made from Open Hearth steel painted—weight per square yard 4.55 lbs. From painted Toncan Metal, weight per square yard 4.55 lbs. or from Galvanized Open Hearth steel, weight per square yard 5.90 lbs. Sheets are 18″x96″ and shipped in bundles of 9 sheets. We do not break bundles.

BERLOY WALL TIES

Berloy Wall Ties serve their purpose exceptionally well. A eries of herringbone corrugations give the ends a firm hold hile the flat center cannot stretch in use.

Berloy Wall Ties are made from galvanized steel in 26 and 4 gauges and in either standard style (7 inches long by ⅝ inch ide crimped both ends) or veneer style (5¾ inches long by inch wide crimped one end and flat with nailholes in other d ‘-- brick veneer work).

BERLOY ¾-INCH RIBPLEX

A COMBINED CENTERING AND REINFORCEMENT, FURRING AND METAL LATH, FOR THE CONSTRUCTION OF FIREPROOF ROOFS, FLOORS, CEILINGS, PARTITIONS AND WALLS.

Fire-resistance and Permanence are being more and more generally demanded in building construction. At the same time increasing costs have led to the demand for greater economy.

In hundreds of structures Berloy ¾-inch Ribplex with concrete has supplied both needs. Ribplex construction is strong, fireproof and as permanent as the concrete.

The use of Berloy ¾-inch Ribplex saves costly form work and greatly reduces time and labor required. Its use effects a substantial saving in materials and because of low dead weight it also permits big reductions in the necessary supporting structure.

The use of Berloy ¾-inch Ribplex with plaster for partitions, walls and ceilings, also forms an efficient and economical type of fire-resistive construction.

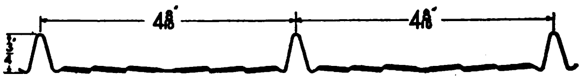
The essential facts concerning Berloy ¾-inch Ribplex and its adaptability and economy for various forms of construction are briefly outlined in the following pages

BERLOY ¾-INCH RIBPLEX

Berloy ¾" Ribplex Applied to the Roof of Spencer-Kellogg Co. Chemical Plant, Edgewater, N. J.

BERLOY ¾-INCH RIBPLEX

Section across ¾" Ribplex sheet. Covering width 24 in. Standard lengths 4, 5, 6, 7, 8, 9, 10, 11 and 12 ft. Gauges 24, 26, 28. Weights per 100 sq. ft. —28 Ga. 50 lbs., 26 Ga. 60 lbs., 24 Ga. 75 lbs.



Cross Section to Show Relation Between Ribs and Mesh

SIZES, WEIGHTS AND OTHER INFORMATION

Three-quarter-inch Berloy Ribplex is made in 6 rib sheets. The ribs are ¾ inch high and spaced 4.8 inches center to center. All sheets have a covering width of 24 inches. Standard lengths carried in stock are 4, 5, 6, 7, 8, 9, 10, 11 and 12 feet in 24, 26 and 28 gauge steel. Other lengths will be cut without charge except for waste. For end splices always allow two inches where splice occurs over supports and eight inches in other cases. Side splices are taken care of in the 24-inch width. No allowance need be made.

Berloy ¾-inch Ribplex weighs per 100 square feet: 24 Ga., 75 lbs.; 26 Ga., 60 lbs.; 28 Ga., 50 lbs.

Code words (steel)—24 Ga., zetry; 26 Ga., zetyr; 28 Ga., zevam.

Berloy ¾-inch Ribplex is always packed in bundles of 9 sheets.

Ribplex is made of Open Hearth Steel or Toncan Metal.

The steel is always thoroughly coated after formation with a good quality of black paint. For Toncan Metal, red paint is used.

The paint protects the metal during shipment, handling or storage so that it is always in good condition for use.

BERLOY ¾-INCH RIBPLEX

Berloy ¾" Ribplex on Pitched Roof Ready for the Concrete—
Golden Grain Milling Company, E. St. Louis, Ill.

RIBPLEX ROOFS

For roofs, Berloy Ribplex construction offers a perfect combination of fire-resistance, permanence and economy.

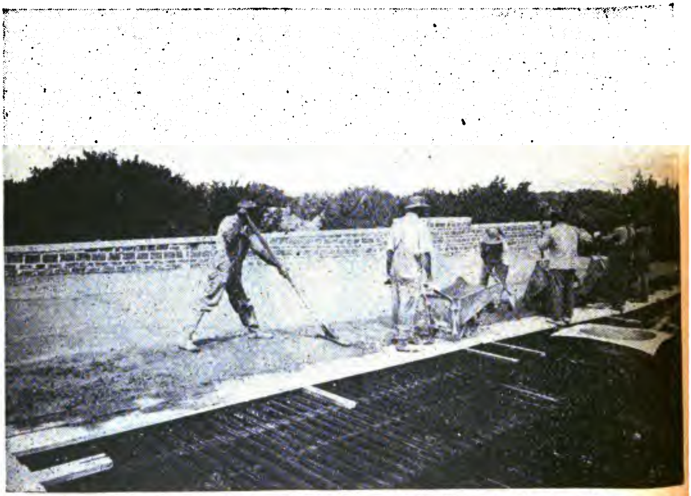
Ribplex extends the field of concrete to steep pitched roofs, sawtooth roofs, etc., where the difficulties of placing form work have heretofore made concrete expensive and impractical.

In all types of roof the large sheets of Berloy ¾" Ribplex go into place rapidly and remove the necessity for form work and reinforcement, which is costly both in labor and material.

As the load tables show, two inches of concrete usually give ample strength for any concrete roof of Ribplex construction.

See details of No. 2 Purlin Clips, page 167.

BERLOY ¾-INCH RIBPLEX



Applying Concrete to ¾" Ribplex—High School, Paola, Kansas

RIBPLEX FLOORS

For floors, ¾-inch Ribplex is used in the same way and offers the same advantages as for flat roofs.

Slabs, of course, should be thicker, but here, too, the safe load table shows that a substantial saving can be made in dead weight, materials and supporting structure.

These light slabs mean not only a big saving of concrete and labor but also a substantial economy in supporting structure because of reduced dead load.

The concrete is applied directly to the Berloy ¾-inch Ribplex and just enough goes through the mesh to embed the metal. The under surface is usually back-plastered and in many types of buildings no further ceiling is required.

MAXIMUM SPANS WITH WET CONCRETE

Gauge of Ribplex	SLAB THICKNESS 2"	2½"	3"	3½"	
28	3' 3"	3'	2' 9"	2' 6"	2'
26	3' 6"	3' 3"	3'	2' 9"	2
24	4'	3' 8"	3' 4"	3'	2

Where spans are longer, temporary supports should pro-vided.

BERLOY ¾-INCH RIBPLEX

SAFE TOTAL LOADS FOR FLOORS AND ROOFS IN POUNDS PER SQUARE FOOT

Thickness of Concrete	Gauge	Resisting Moment Per Foot of Width	SPAN IN FEET							
			3	4	5	6	7	8	9	10
2"	28	3140	291	164	104	73				
Wt.=24 lbs.	26	3720	346	194	124	85	63			
per sq. ft.	24	4370	405	228	146	101	74			
2½"	28	4070	376	211	135	94	69	53		
Wt.=30 lbs.	26	4850	449	253	162	112	82	62		
per sq. ft.	24	6360	588	331	211	147	108	81		
3"	28	5030	465	261	168	116	85	65		
Wt.=36 lbs.	26	5930	550	309	198	137	101	77	61	
per sq. ft.	24	7820	722	406	260	180	133	101	84	
3½"	28	5950	550	310	198	137	101	77	64	
Wt.=42 lbs.	26	7060	654	368	237	163	120	92	72	
per sq. ft.	24	9300	861	484	310	214	158	121	96	
4"	28	6910	640	360	230	160	117	90	71	
Wt.=48 lbs.	26	8160	756	425	272	188	139	106	84	68
per sq. ft.	24	10760	997	561	359	249	183	140	110	90

For safe live loads deduct weight of slab.

Stress in Steel not over 16,000 lbs. per sq. inch.

Stress in Concrete not over 650 lbs. per sq. inch.

Elasticity Ratio Es÷Ec = 15.

Distance of center of gravity above bottom of Sheet, = .21 inch.

TOTAL SECTIONAL AREAS

28 gauge = .1406 sq. in. per foot width.

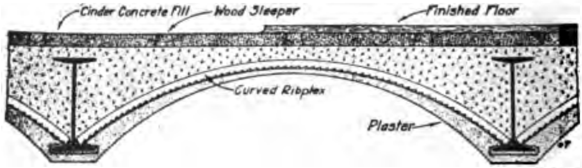
26 gauge = .1688 sq. in. per foot width.

24 gauge = .225 sq. in. per foot width.

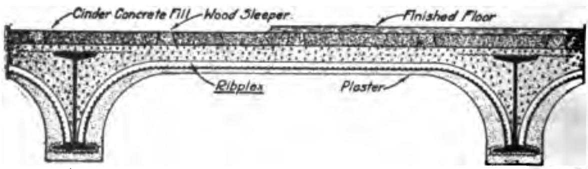
Bending Moment $WL^2/10$ For $WL^2/12$ add, 20%; For $WL^2/8$ deduct 20% from above Loads.

BERLOY ¾-INCH RIBPLEX

CURVED BERLOY RIBPLEX



Berloy ¾" Ribplex, curved to requirements in our plant, is placed with ends resting on lower flanges of beams. The bottom of the beam is covered by a strip of Berloy Diamond Mesh Lath. Concreting and back-plastering then proceeds with the same ease and rapidity as with Berloy Ribplex flat type construction. Curve length may be up to 12 feet. This makes a strong floor with excellent beam protection.



Berloy ¾" Ribplex, curved at each end with flat top, is used in the same way and with advantages similar to the use of the regular curve as outlined above. Length of span and height is limited only by the 12 ft. length of Berloy Ribplex sheets.

Either form of arch can be used to excellent advantage with concrete as well as with steel beams.

Berloy Ribplex can be supplied curved to order with the ribs on the outside of the curve. 13 inches is the minimum standard radius, but at a special price we can furnish ¾-inch Ribplex curved to as small as 6-inch radius.

On curved work where ribs can be placed at right angles to the curve, the Berloy ¾-inch Ribplex can be readily formed as it is applied. In ordering curved Ribplex, give length of chord or span and the rise of the arc at center of span. Where possible the radius should also be given.

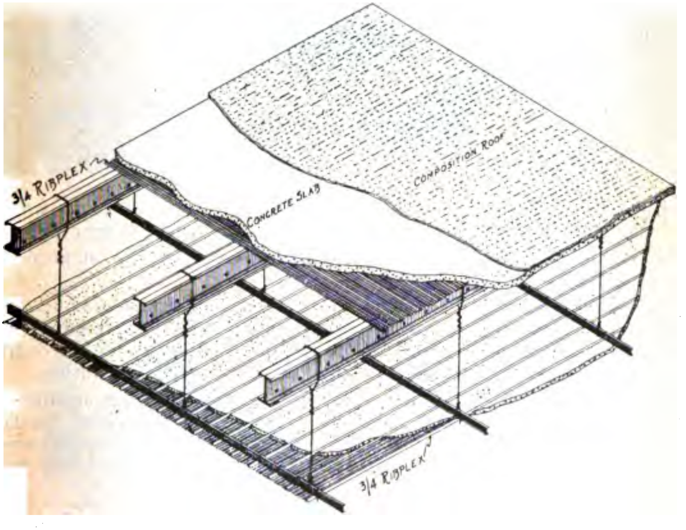
Berloy ¾-inch Ribplex extends the field of the arch or curved construction for concrete roofs and floors with an effecti[ve] and economical construction.

BERLOY ¾-INCH RIBPLEX

CEILINGS

Fire-resistance, low erection costs, freedom from cracks and stains, a firm, even plastering surface and a perfect clinch are some of the advantages offered by Ribplex for ceilings.

With 24 Ga., ¾-inch Ribplex, supports may be spaced up to six feet apart; with 26 gauge up to five feet and with 28 gauge up to four feet. Suspended ceilings are constructed with light supporting channels as shown in illustration. In all cases the ribs remain on the upper side in order to realize their full strength and to give a smooth, even plastering surface beneath.



;tandard suspended ceiling construction for use with any system of roof or ›r construction. This detail shows Berloy Metal Lumber supports with :loy Ribplex used as centering for concrete roof.

'ee details of Nos. 3 and 5 Clips, page 168.

BERLOY ¾-INCH RIBPLEX

WALLS AND PARTITIONS

Ribplex construction provides permanent, light weight walls and partitions, that can be rapidly and economically erected.

For exterior walls the mesh should be against the structural steel supports.

The direct saving in labor and materials is considerable. A substantial saving is also effected through wider spacing of studs and lower dead load. The saving of floor space through thinner walls and partitions is also worthy of consideration.

Three-quarter-inch Ribplex, placed vertically without studding, or furring, forms an ideal base for a solid 2-inch wall or partition. It may be used in up to 6-foot spans without bracing, and in up to 12-foot spans with temporary intermediate bracing for first coat of plaster. See page 150.

Berloy standard ceiling and floor tracks are used as a r :. Strips of Berloy Metal Lath or light expanded metal ben t right angles are also used to form track. This latter forr s especially desirable where partitions are required in a cu d or irregular line.

See Partitions in "Details of Design," pages 123-124.

BERLOY ¾-INCH RIBPLEX

ACCESSORIES—THE RIBPLEX PUNCH

To eliminate wiring the end laps, we can supply a special punch which clinches the ribs in one operation, interlocking them in a firm and secure manner.

The Ribplex punch is made of the best of material and will stand years of service.

No. 1—Side Clip (Exact Size)

No. 1 Applied

No. 1 SIDE CLIP

This clip is used for fastening side laps together. The prongs placed through the meshes are hooked under the lower rib. The clip is then bent over. In spans up to 3 feet, clips are unnecessary. 3 to 5 ft. spans should have one clip at center. 6 to 9 foot spans should have two clips. 9 to 12 ft. spans should have 3 clips, equally spaced from supports and each other.

Necessary side clips are supplied without extra charge.

The illustration shows how the ribs nest together at splices, to form a strong, continuous joint.

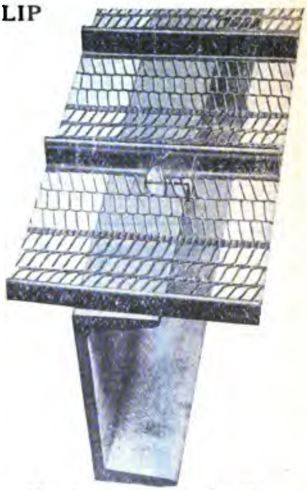
No. 2 PURLIN CLIP

For fastening ¾-inch Ribplex to I-Beam or channels, in floor or roof construction. The clip is placed on the I-Beam or channel under the rib, a prong coming through the meshes on each side of the rib.

The prongs are then clinched against the rib with a hammer. The clip has a spring grip on the beam which insures a very rigid connection.

Clips should be placed at every other rib along length of beam, requiring one for every 9 3-5 inches of longitudinal beam surface.

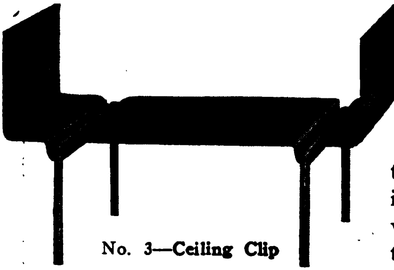
No. 2 Purlin Clip



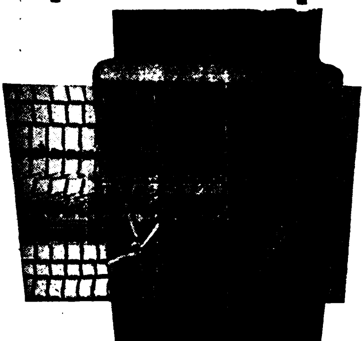
No. 2—Purlin Clip in Place with Prongs Hammered Down

BERLOY ¾-INCH RIBPLEX

ACCESSORIES



No. 3—Ceiling Clip



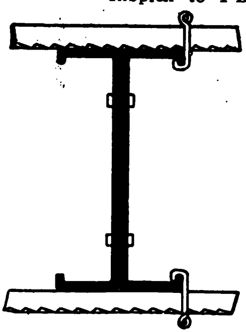
No. 3—Ceiling Clip—Attaching Ribplex to I-Beam

No. 3 CEILING CLIP

For attaching Ribplex to the lower flanges of I-Beams in ceiling construction. The vertical flanges (see illustration) of the clip are bent over the lower flanges of the I-Beam. The wires are placed astride the rib and then twisted until they are tight.

The clips should be placed at every other rib.

The wire is of 16 gauge and is furnished in rolls.



No. 5 METAL LUMBER CLIP

This clip is exactly like No. 1 except that it is 3 inches long.

To apply, it is pushed through the mesh, straddling the Berloy Ribplex rib and hooked over the flange of the metal lumber. 1 loop end is then twisted tig This clip can be applied v quickly and it is used to excell advantage with all Berloy M Lumber shapes.

BERLOY ¾-INCH RIBPLEX

THE MATERIAL OF A THOUSAND USES

To the Architect, Engineer and Contractor, Berloy Ribplex offers endless possibilities for rapid, economical, fireproof and permanent construction.

It replaces many of the older forms of centering and reinforcement for concrete and permits the use of concrete in many forms of construction in which it has heretofore been considered impractical.

The mesh is flexible enough to be formed readily on the job for curved work with ribs inside to act as furring or on the outside if preferred.

Where curving of the ribs is desirable, such curving, to any desired radius, can be readily furnished.

The standard uses of ¾-inch Ribplex have already been discussed. Here are a few of the many other uses to which Ribplex is adapted:

Special Construction.—Balconies, galleries, stairways and similar work where light weight is especially desirable. Ornamental stucco effects, cornices, brackets, false beams, and light walls, panels, etc., in heavy structures.

Small Buildings.—Bath houses, lockers, shower baths, toilets, watchmen's shelters, signal towers, pent houses, rest houses, conveyor shelters, train sheds, cattle runways, outside stairways and similar structures in endless variety.

Walls and Fences.—Storage rooms or booths in storage houses, hand ball courts, partitions, ornamental fences, bridge handrails, roadside guard walls, walls for basins or reservoirs, retaining walls, etc., etc.

Tanks and Containers.—Watering troughs, water tanks, acid tanks, silos, vats, sawdust and ash containers, hot or cold air chambers, etc., etc.

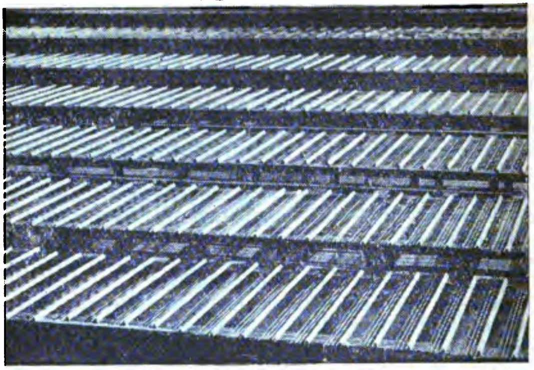
Ducts and Enclosures.—Chimneys, air ducts, vents, elevator wells, dumb waiters and clothes chutes, tunnels, pipes, flumes, culverts, conduits, etc.

Protections and Coverings.—Berloy ¾-inch Ribplex offers ideal reinforcement for centering and furring for beam and column protection, boiler covering, protection for metal flumes, and nilar work.

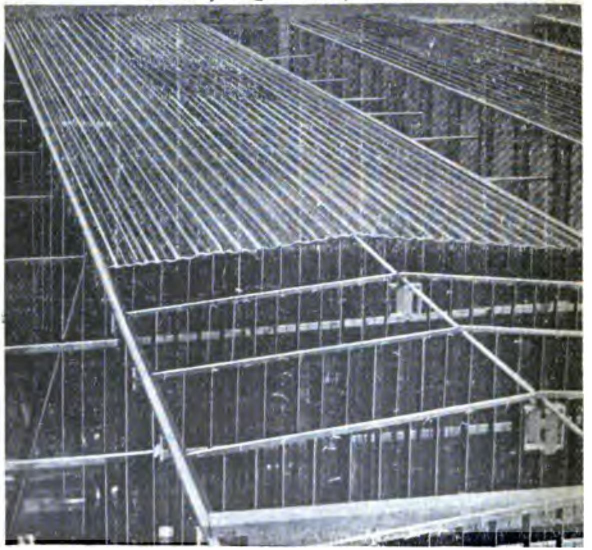
Open Work, Unplastered Enclosures.—Berloy ¾-inch Ribplex a suitable and attractive material for open work enclosures for ng cases, stock rooms, stationery rooms, locker rooms, cashiers' bookkeepers' cages, etc.

These are but a few suggested uses. The Architect, Engineer d Builder will discover many other forms of construction in ich Berloy Ribplex will give added economy, effectiveness, and **ity to concrete.**

BERLOY ¾-INCH RIBPLEX



¾" Ribplex in Light Amphitheatre Construction—
McKinley High School, Canton, O.

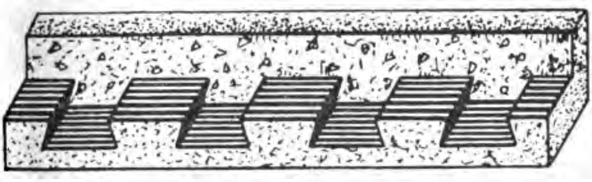


¾" Ribplex Applied for Walls, Roofs and Partitions of Bath-houses at Fort Phoenix, Fairhaven, Mass. (Owned by Union Street Railway of New Bedford, Mass.)

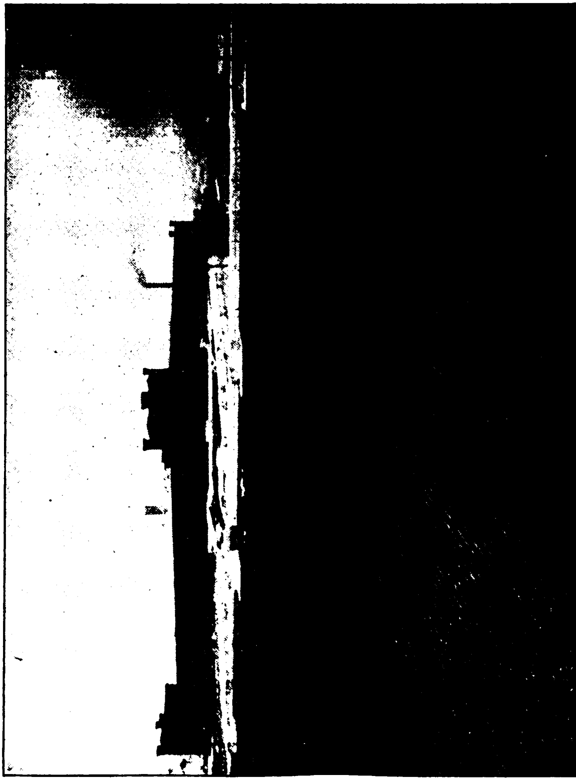
BERLOY FERRO-LITHIC REINFORCING PLATE

FERRO-LITHIC

A centering and reinforcing plate for concrete roofs, floors, walls and special work.



BERLOY FERRO-LITHIC REINFORCING PLATE



Ferro-Lithic Plates in Position on the Roof of the Grand Rapids Lighting & Pumping Plant, Grand Rapids, Mich.

BERLOY FERRO-LITHIC REINFORCING PLATE

Berloy Ferro-Lithic plates are solid plates of sheet steel formed into a series of alternate dovetails or keystone-shaped corrugations as shown in the illustration page 171. These dovetails hold plaster or concrete firmly in place on both sides of the sheet. In addition the dovetails are cross-crimped which roughens the surface and increases the mechanical bond between concrete and steel.

Because so much of the metal is on edge, Ferro-Lithic possesses very great strength. It will support the wet concrete for floor and roof slabs without temporary bracing except in the longer spans, and because of the interlocking key the finished construction is very strong.

Ferro-Lithic makes a weather-tight roof or wall without concrete. Concreting may be delayed for some weeks by weather, labor conditions, or other causes without serious disadvantage.

Ferro-Lithic plates have been extensively used with both concrete and steel framing—as centering and reinforcing for concrete slabs in flat or arched floors—for flat, pitched or saw-tooth roofs, for sidings of buildings, for bridge floors, lining of coal bunkers, sidewalk construction over basement space and similar work.

ince the metal is fully protected on both sides, Ferro-Lithic struction is especially suitable for buildings exposed to smoke, fumes, gases, or moisture, such as chemical works, collieries, anizing plants, plating works, and train sheds.

BERLOY FERRO-LITHIC REINFORCING PLATE

Ferro-Lithic plates can be supplied in any length up to 12 feet, wih dovetails ½″, ⅝″ or ¾″ deep and in 24 and 26 gauge.

Plates can be supplied painted if desired. 24 gauge ½-inch depth plates can also be supplied curved to any desired radius.

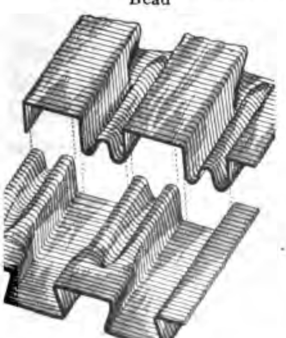
Effective covering widths of Ferro-Lithic plates and their weights (unpainted) per 100 sq. ft. are shown in the following table:

Gauge of Metal	Depth of Corrugations	Weight Per 100 Square Feet*	Effective Covering Width
24	½″	150 lbs.	20″
24	⅝″	156 lbs.	18″
24	¾″	170 lbs.	16½″
26	½″	113 lbs.	20″
26	⅝″	117 lbs.	18″
26	¾″	127 lbs.	16½″

* Without allowance for end laps.

Special narrow plates to fill out odd dimensions can be furnished.

Upper Plate—Specify Bottom Bead



Lower Plate—Specify Top Bead

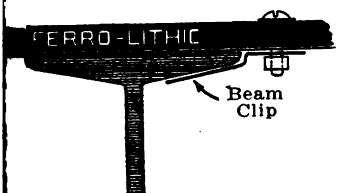
END SPLICES

Unless otherwise specified Ferro-Lithic plates are formed for splicing as shown. These end beads extend for a distance of five inches from each end of every plate. This method permits rapid constr m and makes a firm splice an n even plastering surface. An d lap of at least three inches sh ld be allowed for.

BERLOY FERRO-LITHIC REINFORCING PLATE

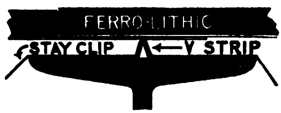
SIDE SPLICES

Side splices are secured by means of a latch or "side clip" as shown in the illustration. These side clips are placed at intervals of two feet on all side splices and hold the plates firmly in place.



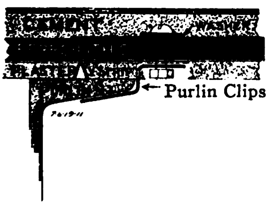
BEAM CLIPS

These clips are bolted to the Ferro-Lithic at intervals of one foot along the beams or purlins. Wherever plates lap above a beam or purlin one beam clip will hold both plates.



METAL V-STRIP

These V-strips are used with Ferro-Lithic roof or siding construction in order that the plaster backing may be continuous. Stay clips applied every three feet hold the V-strip in place. The necessary stay clips are included without extra charge in all shipments of V-strips, which are supplied in 8-foot lengths, weight per 100 feet including stay clips, 13¼ lbs.



PURLIN CLIPS

These clips are similar to beam clips, but are deeper to allow for the added depth of the V-strip where used.

Side clips, beam and purlin clips are sold in lots of one hundred; weight per hundred side clips, including necessary bolts and nuts, 1 ɔs.; beam and purlin clips, including necessary bolts and nuts, 1 s.

ılts ¾-inch long are used for ½-inch deep plates and 1-inch t for ⅝-inch and ¾-inch plates.

BERLOY FERRO-LITHIC REINFORCING PLATE

SPECIAL FERRO-LITHIC CONSTRUCTION

We will not attempt in these pages to give specific suggestions for the use of Ferro-Lithic for sidewalks, coal bunkers, car floors and other special construction.

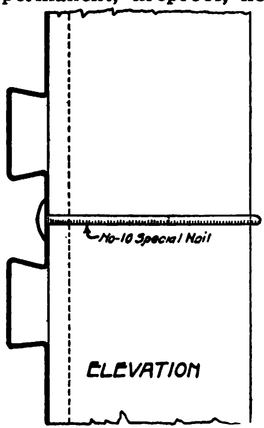
The information given will enable the architect or engineer to use Ferro-Lithic for any special construction to which it is adapted, or we will gladly furnish additional information and suggestions to apply on any such special use.

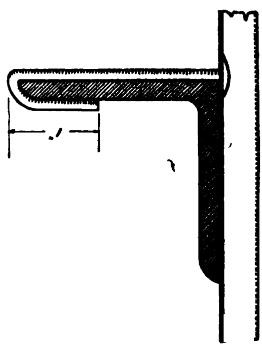
FERRO-LITHIC FOR SIDINGS

For sidings, Ferro-Lithic is applied with the dovetails running either horizontally or on the incline. 26 gauge material is usually heavy enough for siding work.

Application is made directly upon the framing or the V-strip may be used to hold the plates far enough away to provide space for interior plaster.

Ferro-Lithic siding is often used on elevator cupolas and in similar places where ordinary centering work is practically out of the question. It is also used extensively in the walls of train sheds, tobacco warehouses and similar places to form a light, permanent, fireproof, non-supporting partition or wall.





The "No. 10 special" nail, a standard article in the hardw e trade, is especially suited to the application of Ferro-Lithic r siding as shown in diagrams herewith.

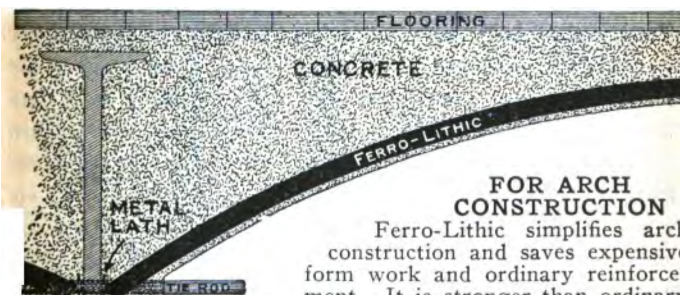
The Ferro-Lithic beam clip as shown on page 175 is also wi y used in attaching Ferro-Lithic for siding.

BERLOY FERRO-LITHIC REINFORCING PLATE

FERRO-LITHIC FLOOR CONSTRUCTION

In figuring supporting strength of arched Ferro-Lithic construction, use the same standards as for ordinary concrete arch work. The increased strength becomes an added factor of safety.

Only ½-inch Ferro-Lithic in 24 gauge is supplied curved. In ordering, give length of span and rise of arch. Radius should also be given if possible.



FOR ARCH CONSTRUCTION

Ferro-Lithic simplifies arch construction and saves expensive form work and ordinary reinforcement. It is stronger than ordinary corrugated sheets and offers a splendid bond for plaster beneath, as well as for concrete above.

ɔr lengths of curved sheets see tables on pages 239-241.

BERLOY FERRO-LITHIC REINFORCING PLATE

FOR FLAT SLAB CONSTRUCTION

Ferro-Lithic offers many advantages. It adds to strength and reduces erection costs. It gives an excellent plastering surface beneath and replaces all centering except for a temporary support for the longer spans.

For floors, Ferro-Lithic is applied directly to the beams and fastened with beam clips, V-strip usually being omitted.

TABLE OF SAFE LIVE LOADS

Factor of Four

FLAT FERRO-LITHIC REINFORCED SLABS

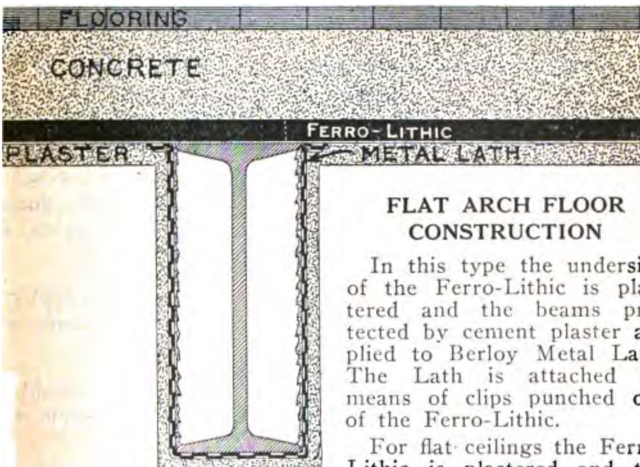
Clear Span.	DEPTH OF CONCRETE OVER TOP OF PLATES								
	0″	½″	1″	1½″	2″	2½″	3″	3½″	4″
2′ 0″	159	415	718	1025	1325	1665	1955	2270	2620
2′ 6″	100	265	460	655	848	1065	1250	1455	1680
3′ 0″	70	184	319	455	588	738	869	1010	1165
3′ 6″	53	138	238	335	438	539	638	741	855
4′ 0″	40	105	181	256	335	413	489	568	655
4′ 6″	31	84	144	208	269	330	394	458	519
5′ 0″	25	68	116	168	218	268	319	370	420
5′ 6″	21	54	95	138	179	221	253	305	346
6′ 0″	18	45	80	115	150	186	221	256	291
6′ 6″	15	38	69	99	129	159	189	219	248
7′ 0″	13	33	59	85	111	136	163	189	214
7′ 6″	11	29	51	74	95	119	141	164	185
8′ 0″	10	25	45	65	84	104	124	144	163
8′ 6″	9		40	59	76	93	111	124	144
9′ 0″	8			52	68	83	99	113	
9′ 6″	7				60	75	88	101	
10′ 0″	6					68	79	91	

Note:—Loads for ½″ depth and No. 24 gauge only.
Loads per sq. ft. uniformly distributed.
Loads below heavy lines show excessive deflation.
Data of safe loads for other depths and gauges furnished on application

BERLOY FERRO-LITHIC REINFORCING PLATE

One-Half Inch of Concrete Over Plate

The above test was made upon one No. 24 gauge Ferro-Lithic Plate, ½-inch depth of corrugation, 20 inches wide. Clear span 6 feet 0 inches. Covered with a 1-2-4 mixture of concrete ½-inch above top of corrugation and plastered on under side ⅜-inch below corrugation. The cement was one month old when test was made. The deflection was measured by a lever with a 3 to 1 arm and was recorded at every 100 pounds increase of load. It was found to be of comparatively even variation, a maximum deflection of ⅞-inch being reached.



FLAT ARCH FLOOR CONSTRUCTION

In this type the underside of the Ferro-Lithic is plastered and the beams protected by cement plaster applied to Berloy Metal Lath. The Lath is attached by means of clips punched out of the Ferro-Lithic.

For flat ceilings the Ferro-Lithic is plastered and the c[illegible]ng attached to the lower flanges of the beams in the usual w[illegible].

[illegible]rloy Diamond Mesh Lath or ⅜-inch Ribplex is recomm[illegible]ed for ceiling construction.

BERLOY FERRO-LITHIC REINFORCING PLATE

Attaching Ferro-Lithic With Beam Clip. Note the Metal "V" Strip Applied

FERRO-LITHIC ROOF CONSTRUCTION

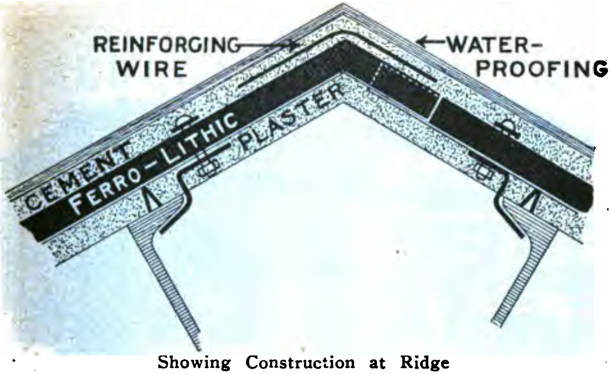
The sheets of Ferro-Lithic may be butted at the ridge but bending the sheets is preferable. This bending can be done on the job without great difficulty. In the illustration above, note how the sheets are bent in sawtooth roof construction.

Berloy Ferro-Lithic makes the use of concrete possible on steep-pitched and sawtooth roofs as well as on flat roofs, without excessive erection costs.

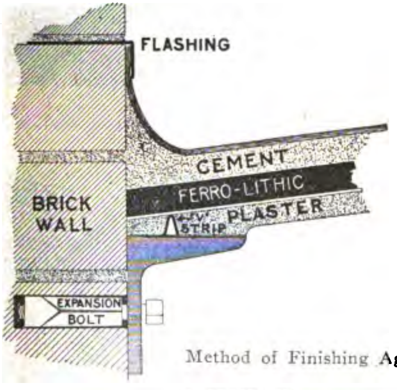
When properly applied Ferro-Lithic makes a water-tight f without concrete and concreting may be delayed for some w s if desirable.

Purlins should be spaced 4 feet 10½ inches on centers. s permits the use of plates 10 feet long with a 3-inch end lap, i makes temporary supports unnecessary.

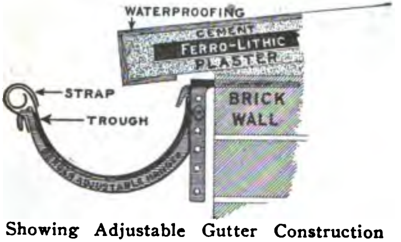
BERLOY FERRO-LITHIC REINFORCING PLATE



Showing Construction at Ridge

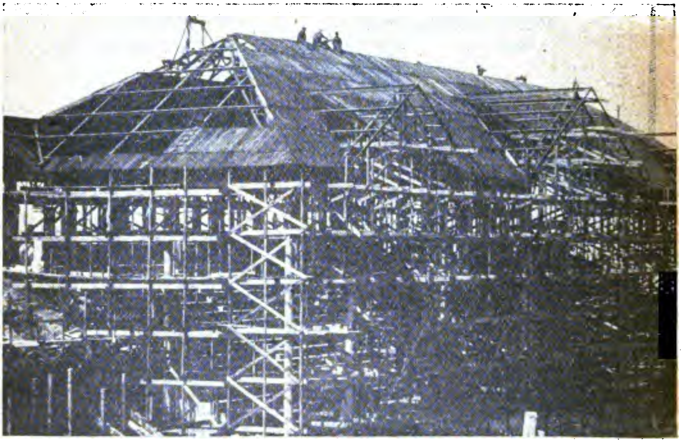


Method of Finishing Against Adjoining Walls



Showing Adjustable Gutter Construction

BERLOY FERRO-LITHIC REINFORCING PLATE

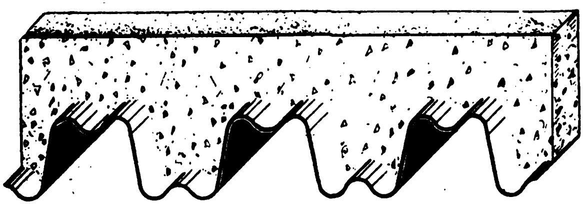


Laying Ferro-Lithic Roof Plates at the Syracuse Stadium Grand Stand, Syracuse, N. Y.

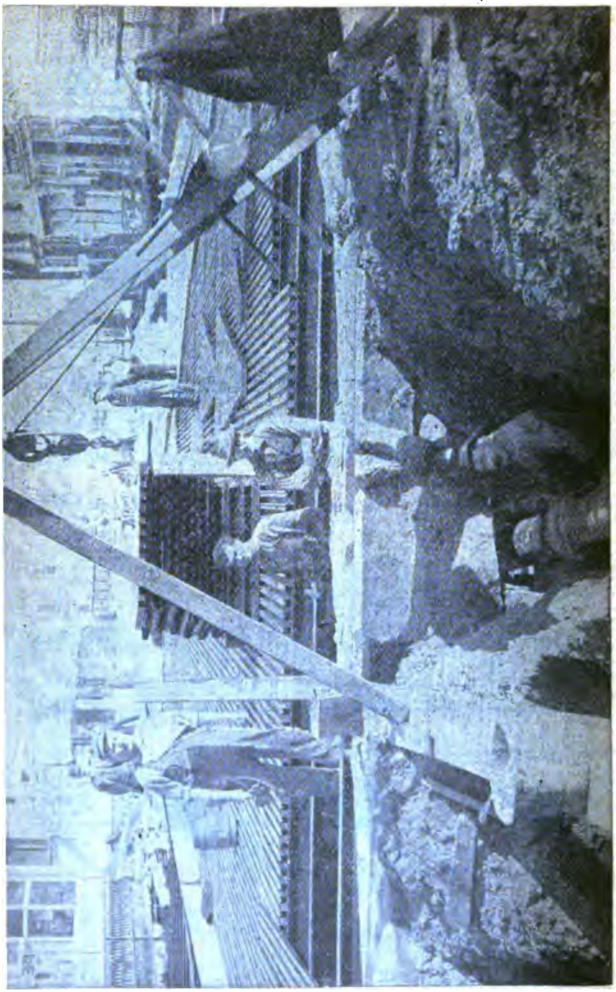
Laying Concrete on Ferro-Lithic in Sawtooth Roof Constructioı

BERLOY MULTIPLEX REINFORCING PLATES

A Reinforcing Plate for Concrete in Heavy Service Floor Construction



ERLOY MULTIPLEX REINFORCING PLATES



For Heavy Service Floor Construction

BERLOY MULTIPLEX REINFORCING PLATES

Multiplex plates are sheets of steel shaped into multiform channels from two to four inches in depth. Multiplex is used as centering and reinforcement for concrete in heavy service floors.

Its use molds the concrete into a series of beams, reducing dead weight by about 25% and making a very strong, easily installed construction.

The Multiplex remains a part of the floor and the fact that it forms a tight ceiling for the room below makes Multiplex construction especially desirable in powder mills, sugar refineries, chemical plants and similar places where droppings of any kind, especially of particles of concrete, from above, would be objectionable.

Multiplex is used in two general classes of construction. The first is in large structures like those mentioned above, in Warehouses, Foundries, Jails, Mine buildings and similar heavy service construction.

The second general use is in heavy service sidewalks and driveways over tunnels and basements, above pipes, ducts and vaults where heavy loads occur, and most important of all in bridge flooring.

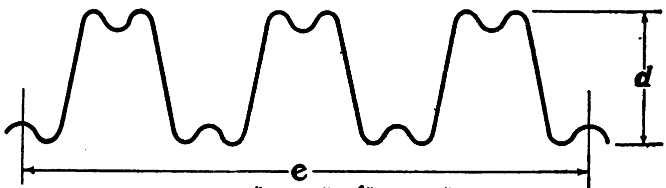
Multiplex construction is easily installed by common labor and removes the necessity for temporary centering.

BERLOY MULTIPLEX REINFORCING PLATES

The plates are sufficiently strong to support the weight of workmen and materials while concreting and no dripping or sifting of materials into the room below can occur, either during or after construction.

Any inquiry will have our prompt attention.

END SECTION OF MULTIPLEX STEEL PLATE



Depth's 2", 2½", 3", 3½" and 4"

d = depth. e = effective covering width.

When d = 2", e = 13½" When d = 3", e = 14½"

When d = 2½", e = 14" When d = 3½", e = 15"

When d = 4", e = 15"

Widths.

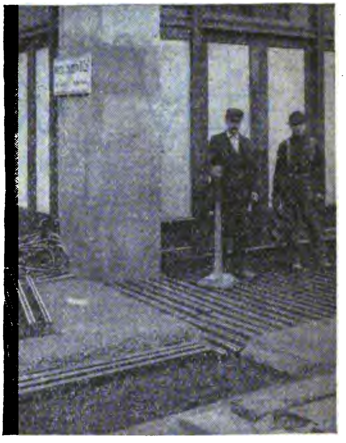
The three manifold plates as above described are standard and of maximum width.

Each complete inverted channel section is considered as one manifold.

Special width plates consisting of one or two manifold ıre furnished to make possible the meeting of various buildin dimensions.

The one and two manifold plates are respectively ⅓ and as wide in covering width as standard plates, and sides are cı nd laps provided for as shown above.

BERLOY MULTIPLEX REINFORCING PLATES



SIZES, WEIGHTS, ETC.

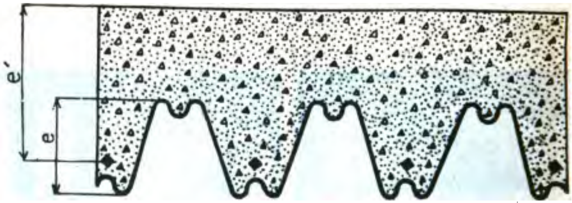
Multiplex plates are supplied plain, painted or galvanized in gauges 16, 18, 20, 22 and 24, in depths of 2, 2½, 3, 3½ and 4 inches. Any length desired up to 10 feet will be supplied. Widths vary with depth of corrugations (see table).

These plates should have a lap of 3 inches over supports and a bearing of 2 or 3 inches at ends.

ordering, send sketch or blue print showing general layout of ɔor including openings, supporting walls, beams, or other su ·ʼrts with dimensions.

.icate also if length of plates must be exact, as ordinarily th will be variations up to 1 inch which in most cases is pe issible.

BERLOY MULTIPLEX REINFORCING PLATES



To secure best results with Multiplex construction, small reinforcing rods should be placed in every manifold or every other manifold in the position shown above.

The concrete above the plate is usually made of the same depth as the plate itself (e) making a total thickness of double the depth of the plate or 2e.

The centers of the rods should be 1 inch above the bottom line of the plate, and the concrete slab can be designed and figured as if it were an ordinary slab with an effective depth equal to e′.

EFFECTIVE COVERING WIDTHS OF MULTIPLEX PLATES AND WEIGHTS PER 100 SQ. FT. ARE AS FOLLOWS:

Depth	2″	2½″	3″	3½″	4″
Effective covering width	13½″	14″	14½″	15″	15″
Wt. per 100 sq. ft. 16 ga	482	500	518	534	600
Wt. per 100 sq. ft. 18 ga	386	400	414	426	480
Wt. per 100 sq. ft. 20 ga	289	300	310	320	360
Wt. per 100 sq. ft. 22 ga	241	250	259	267	
Wt. per 100 sq. ft. 24 ga	193	200	207	213	

See page 186.

The above weights refer to Multiplex without paint or galva[illegible]g.

BERLOY MULTIPLEX REINFORCING PLATES

SAFE LOADS ON MULTIPLEX STEEL PLATES WITHOUT FILLING

Metal Gauge No.	Depth of Plate	*LOADS PER SQUARE FOOT IN POUNDS DISTANCE BETWEEN SUPPORTS 3′	4′	5′	6′	7′	8′	9′	10′
16	4″	3103	1736	1105	762	555	421	330	264
18	4″	2334	1307	831	573	411	315	246	197
20	4″	1659	928	589	406	295	223	174	138
22	4″	1330	743	472	324	235	177	137	110
24	4″	1051	588	391	277	199	165	130	102
16	3½″	2753	1543	982	678	494	375	293	234
18	3½″	2067	1157	736	507	369	280	219	175
20	3½″	1463	818	520	358	260	197	154	120
22	3½″	1104	617	391	269	196	147	114	91
24	3½″	957	548	336	233	171	132	103	83
16	3″	2106	1181	742	520	379	288	225	180
18	3″	1589	910	567	391	286	216	169	136
20	3″	1274	714	454	313	229	174	135	109
22	3″	906	507	322	222	161	122	95	77
24	3″	727	402	267	188	123	101	79	64
16	2½″	1657	927	590	406	396	224	175	140
18	2½″	1249	700	444	306	223	169	132	106
20	2½″	890	497	316	218	158	120	94	74
22	2½″	713	398	253	174	127	95	75	59
24	2½″	592	316	203	147	106	79	64	51
16	2″	970	544	345	236	171	130	100	80
18	2″	734	410	260	179	129	97	88	60
	2″	592	330	209	145	105	79	62	49
	2″	470	264	167	115	83	62	48	38
	2″	352	197	119	87	64	48	39	31

*T bove Safe Loads include weight of Plates.

BERLOY MULTIPLEX REINFORCING PLATES

SAFE LOADS ON MULTIPLEX STEEL PLATES FILLED WITH CONCRETE ONE INCH ABOVE PLATE

Metal Gauge No.	Depth of Plate	LOADS PER SQUARE FOOT IN POUNDS. DISTANCE BETWEEN SUPPORTS 3′	4′	5′	6′	7′	8′	9′	10′
16	4″	4230	2370	1510	1040	760	575	450	360
18	4″	3180	1780	1130	780	570	430	335	270
20	4″	2260	1265	800	550	400	300	235	185
22	4″	1810	1010	640	435	320	240	185	145
24	4″	1408	792	507	352	258	198	156	127
16	3½″	3755	2100	1340	915	672	510	400	320
18	3½″	2815	1575	1000	790	510	380	295	235
20	3½″	1990	1115	705	485	350	265	205	165
22	3½″	1500	840	530	360	265	201	150	120
24	3½″	1280	720	461	320	235	180	142	115
16	3″	2820	1610	1025	705	515	390	305	240
18	3″	2165	1210	760	530	385	290	235	180
20	3″	1730	970	615	420	305	230	180	145
22	3″	1230	685	435	295	215	160	125	100
24	3″	978	550	352	244	169	137	109	88
16	2½″	2260	1265	905	555	405	305	240	190
18	2½″	1700	950	605	415	305	230	180	140
20	2½″	1210	675	430	295	215	160	125	100
22	2½″	970	540	340	235	175	130	100	80
24	2½″	770	433	277	192	143	108	86	69
16	2″	1330	745	475	325	235	180	140	110
18	2″	1005	560	355	245	180	135	120	85
20	2″	810	450	285	200	145	110	85	65
22	2″	640	350	230	155	115	85	65	50
24	2″	454	255	163	117	87	65	25	41

Note. (1). Concrete Filling consists of 1 part Portland cement, 3 parts clean, sharp, angular sand, mixed with 5 parts of crushed furnace slag.

(2). Load is total Safe Load less weight of Concrete Filling and weight of plate itself.

(3). Estimated weight of concrete per cubic foot, 90 pounds.

(4). These tables represent safe loads with factor of safety of four and sl... the strength of new work. For absolute permanence and as additional factor of sa... t is recommended that rods be added according to specific requirements.

Tables prepared from **Actual Tests** under the direction of Hallstead & Mc... er, Civil Engineers.

GENERAL INFORMATION

The information included under this heading is for reference only as it does not refer to products sold by this Company.

GENERAL INFORMATION

Including:

Safe load carrying capacities of structural steel beams.

Safe load carrying capacities of structural steel channels.

Strength of beams and channels with plates added.

Safe load carrying capacities of structural steel columns.

Standard bearing plate details.

Allowable bearing on foundations.

Weights of partitions per square foot.

Rivet tables.

Sizes and weights of small rivets.

Weight and area of steel wire.

U. S. and Birmingham or Stubs gauges.

Sizes, weights, etc., nails and brads.

Sizes and weights of stove bolts.

Sizes and weights of machine bolts.

Sizes and weights of washers.

Sheet steel differentials and extras.

Lengths of curved sheets.

Melting points of metals.

GENERAL INFORMATION

STANDARD ROLLED I BEAMS

SAFE LOADS IN POUNDS UNIFORMLY DISTRIBUTED

Safe loads below are figured for fibre stress of 16,000 lbs. per square inch and include weight of beam.

Clear Span in Feet	4″ 7.7 lbs.	4″ 8.5 lbs.	5″ 10 lbs.	5″ 12.25 lbs.	6″ 12.5 lbs.	6″ 14.75 lbs.	Clear Span in Feet
4	8000	8500	12900	14500	19400	21300	4
5	6400	6800	10300	11600	15500	17100	5
6	5300	5600	8600	9700	12900	14200	6
7	4500	4800	7400	8300	11100	12200	7
8	4000	4200	6400	7300	9700	10700	8
9	3500	3800	5700	6500	8600	9500	9
10	3200	3400	5200	5800	7700	8500	10
11			4700	5300	7000	7800	11
12			4300	4800	6500	7100	12
13					6000	6600	13
14					5500	6100	14

For safe loads below the heavy lines, the deflections will be greater than the allowable limit for plastered ceilings or 1/360 span.

urtesy Carnegie Steel Co. Pocket Companion 22nd Edition.

GENERAL INFORMATION

STANDARD ROLLED I BEAMS

SAFE LOADS IN POUNDS UNIFORMLY DISTRIBUTED

Safe loads below are figured for fibre stress of 16,000 lbs. per square inch and include weight of beam.

Clear Span in Feet	7″ 15.3 lbs.	7″ 17.5 lbs.	8″ 18.4 lbs.	8″ 20.5 lbs.	9″ 21.8 lbs.	9″ 25 lbs.	Clear Span in Feet
4	27600	29900	37900	40400	50300	54500	4
5	22100	23900	30300	32300	40300	43600	5
6	18400	19900	25300	26900	33600	36300	6
7	15800	17100	21700	23100	28800	31100	7
8	13800	14900	19000	20200	25200	27200	8
9	12300	13300	16900	18000	22400	24200	9
10	11000	11900	15200	16200	20100	21800	10
11	10000	10900	13800	14700	18300	19800	11
12	9200	10000	12600	13500	16800	18200	12
13	8500	9200	11700	12400	15500	16800	13
14	7900	8500	10800	11500	14400	15600	14
15	7400	8000	10100	10800	13400	14500	15
16	6900	7500	9500	10100	12600	13600	16
17			8900	9500	11800	12800	17
18			8400	9000	11200	12100	18
19					10600	11500	19
20					10100	10900	20
21							21
22							22
23							23
24							24
25							25

For safe loads below the heavy lines, the deflections will be greater than the allowable limit for plastered ceilings or 1/360 span.

Courtesy Carnegie Steel Co. Pocket Companion 22nd Edition.

GENERAL INFORMATION

STANDARD ROLLED I BEAMS

SAFE LOADS IN POUNDS UNIFORMLY DISTRIBUTED

Safe loads below are figured for fibre stress of 16,000 lbs. per square inch and include weight of beam.

Clear Span in Feet	10″ 25.4 lbs.	10″ 30 lbs.	12″ 31.8 lbs.	12″ 35 lbs.	15″ 42.9 lbs.	15″ 45 lbs.	Clear Span in Feet
5	52100	57200	76700	81200			5
6	43400	47700	63900	67600	104700	108100	6
7	37200	40900	54800	58000	89800	92600	7
8	32600	35800	48000	50700	78500	81000	8
9	28900	31800	42600	45100	69800	72000	9
10	26000	28600	38400	40600	62800	64800	10
11	23700	26000	34900	36900	57100	58900	11
12	21700	23900	32000	33800	52400	54000	12
13	20000	22000	29500	31200	48300	49900	13
14	18600	20400	27400	29000	44900	46300	14
15	17400	19100	25600	27100	41900	43200	15
16	16300	17900	24000	25400	39300	40500	16
17	15300	16800	22600	23900	37000	38100	17
18	14500	15900	21300	22500	34900	36000	18
19	13700	15100	20200	21400	33100	34100	19
20	13000	14300	19200	20300	31400	32400	20
21	12400	13600	18300	19300	29900	30900	21
22	11800	13000	17400	18400	28600	29500	22
23			16700	17600	27300	28200	23
24			16000	16900	26200	27000	24
25			15300	16200	25100	25900	25
26			14800	15600	24200	24900	26
27					23300	24000	27
28					22400	23200	28
					21700	22400	29
					20900	21600	30
					20300	20900	31
					19600	20300	32

'or safe loads below the heavy line, the deflections will be greater t the allowable limit for plastered ceilings or 1/360 span.

''rtesy Carnegie Steel Co. Pocket Companion 22nd Edition.

GENERAL INFORMATION

STANDARD ROLLED I BEAMS

SAFE LOADS IN POUNDS UNIFORMLY DISTRIBUTED

Safe loads below are figured for a fibre stress of 16,000 lbs. per square inch and include weight of beam.

Clear Span in Feet	18″ 54.7 lbs.	18″ 60 lbs.	20″ 65.4 lbs.	20″ 70 lbs.	24″ 79.9 lbs.	24″ 85 lbs.	Clear Span in Feet
21	44900	47500	59400	62000	88300	91800	21
22	42900	45300	56700	59100	84300	87600	22
23	41000	43400	54200	56600	80700	83800	23
24	39300	41600	52000	54200	77300	80300	24
25	37700	39900	49900	52000	74200	77100	25
26	36300	38400	48000	50000	71400	74100	26
27	34900	37000	46200	48200	68700	71400	27
28	33700	35600	44600	46500	66300	68800	28
29	32500	34400	43000	44900	64000	66400	29
30	31400	33300	41600	43400	61800	64200	30
31	30400	32200	40200	42000	59800	62200	31
32	29500	31200	39000	40700	58000	60200	32
33	28600	30200	37800	39400	56200	58400	33
34	27700	29300	36700	38300	54600	56700	34
35	26900	28500	35600	37200	53000	55100	35
36	26200	27700	34700	36100	51500	53500	36
37	25500	27000	33700	35200	50100	52100	37
38	24800	26300	32800	34200	48800	50700	38
39			32000	33400	47600	49400	39
40			31200	32500	46400	48200	40
41			30400	31700	45300	47000	41
42			29700	31000	44200	45900	42
43					43100	44800	43
44					42200	43800	44
45					41200	42800	45
46					40300	41900	46
47					39500	41000	
48					38700	40100	
49					37900	39300	
50					37100	38500	

For safe loads below the heavy line, the deflections will be greater than the allowable limit for plastered ceilings or 1/360 span.

Courtesy Carnegie Steel Co. Pocket Companion 22nd Edition.

GENERAL INFORMATION
BETHLEHEM I BEAMS
SAFE LOADS UNIFORMLY DISTRIBUTED IN TONS OF 2000 LBS.

Beams being secured against yielding sideways.

Span in Feet	30″ I B30 120 lbs.	28″ I B28 105 lbs.	26″ I B26 90 lbs.	Span in Feet	24″ I B24 a 84 lbs.	24″ I B24 73 lbs.
18	103.50	84.95	67.86	12	88.22	77.45
19	98.05	80.48	64.29	13	81.43	71.49
20	93.15	76.46	61.07	14	75.62	66.38
21	88.71	72.82	58.16	15	70.58	61.96
22	84.68	69.51	55.52	16	66.16	58.08
23	81.00	66.49	53.11	17	62.27	54.67
24	77.62	63.72	50.89	18	58.81	51.63
25	74.52	61.17	48.86	19	55.72	48.91
26	71.65	58.81	46.98	20	52.93	46.47
27	69.00	56.64	45.24	21	50.41	44.26
28	66.54	54.61	43.62	22	48.12	42.24
29	64.24	52.73	42.12	23	46.03	40.41
30	62.10	50.97	40.71	24	44.11	38.72
31	60.10	49.33	39.40	25	42.35	37.17
32	58.22	47.79	38.17	26	40.72	35.74
33	56.45	46.34	37.01	27	39.21	34.42
34	54.79	44.98	35.92	28	37.81	33.19
35	53.23	43.69	34.90	29	36.50	32.05
36	51.75	42.48	33.93	30	35.29	30.98
37	50.35	41.33	33.01	31	34.15	29.98
38	49.03	40.24	32.14	32	33.08	29.04
39	47.77	39.21	31.32	33	32.08	28.16
40	46.57	38.23	30.54	34	31.14	27.33
41	45.44	37.30	29.79	35	30.25	26.55
42	44.36	36.41	29.08	36	29.41	25.82
43	43.33	35.56	28.41	37	28.61	25.12
44	42.34	34.75	27.76	38	27.86	24.46
45	41.40	33.98	27.14	39	27.14	23.83
5	40.50	33.24	26.55	40	26.47	23.23
[illegible]	39.64	32.54	25.99			
[illegible]	38.81	31.86	25.45			

afe loads given include weight of beam. Maximum fibre stress, 1)0 lbs. per square inch.

)ads given above the heavy lines are greater than safe loads for w rippling.

tesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION
BETHLEHEM I BEAMS
SAFE LOADS UNIFORMLY DISTRIBUTED IN TONS OF 2000 LBS.

Beams being secured against yielding sideways.

Span in Feet	20″ I					18″ I		
	B20 a		B20			B18		
	82 lbs.	72 lbs.	69 lbs.	64 lbs.	59 lbs.	59 lbs.	54 lbs.	48.5 lbs.
12	69.33	65.18	56.40	54.32	52.10	43.62	41.58	39.42
13	63.99	60.17	52.06	50.14	48.09	40.26	38.38	36.39
14	59.42	55.87	48.34	46.56	44.65	37.39	35.64	33.79
15	55.46	52.14	45.12	43.45	41.68	34.90	33.26	31.54
16	51.99	48.88	42.30	40.74	39.07	32.71	31.18	29.56
17	48.94	46.01	39.81	38.34	36.77	30.79	29.35	27.83
18	46.22	43.45	37.60	36.21	34.73	29.08	27.72	26.28
19	43.78	41.17	35.62	34.31	32.90	27.55	26.26	24.90
20	41.60	39.11	33.84	32.59	31.26	26.17	24.95	23.65
21	39.61	37.25	32.23	31.04	29.77	24.93	23.76	22.53
22	37.81	35.55	30.76	29.63	28.42	23.79	22.68	21.50
23	36.17	34.01	29.42	28.34	27.18	22.76	21.70	20.57
24	34.66	32.59	28.20	27.16	26.05	21.81	20.79	19.71
25	33.28	31.29	27.07	26.07	25.01	20.94	19.96	18.92
26	32.00	30.08	26.03	25.07	24.04	20.13	19.19	18.19
27	30.81	28.97	25.07	24.14	23.15	19.39	18.48	17.52
28	29.71	27.93	24.17	23.28	22.33	18.69	17.82	16.89
29	28.69	26.97	23.34	22.48	21.56	18.05	17.21	16.31
30	27.73	26.07	22.56	21.73	20.84	17.45	16.63	15.77
31	26.84	25.23	21.83	21.03	20.17	16.88	16.10	15.26
32	26.00	24.44	21.15	20.37	19.54	16.36	15.59	14.78
33	25.21	23.70	20.51	19.75	18.94	15.86	15.12	14.33
34	24.47	23.00	19.90	19.17	18.39	15.40	14.68	13.91
35	23.77	22.35	19.34	18.62	17.86	14.96	14.26	13.52
36	23.11	21.73	18.80	18.11	17.37	14.54	13.86	13.14
37	22.48	21.14	18.29	17.62	16.90	14.15	13.49	12.78
38	21.89	20.58	17.81	17.15	16.45	13.77	13.13	12.45
39	21.33	20.06	17.35	16.71	16.03	13.42	12.79	12.13
40	20.80	19.55	16.92	16.30	15.63	13.09	12.47	11

Safe loads given include weight of beam. Maximum fibre s[illegible], 16,000 lbs. per square inch.

Loads given above the heavy lines are greater than safe load[illegible] web crippling.

Safe loads given below the dotted lines produce deflections ex[illegible]ing 1/360 of the span.

Courtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION
BETHLEHEM I BEAMS

SAFE LOADS UNIFORMLY DISTRIBUTED IN TONS OF 2000 LBS.

Beam being secured against yielding sideways.

Span in Feet	15″ I B15 b 71 lbs.	15″ I B15 a 54 lbs.	15″ I B15 46 lbs.	15″ I B15 41 lbs.	15″ I B15 38 lbs.	Span in Feet	12″ I B12a 36 lbs.	12″ I B12 32 lbs.	12″ I B12 28.5 lbs.
12	47.18	36.15	28.73	27.06	26.23	9	26.59	22.57	21.36
13	43.55	33.37	26.52	24.98	24.21	10	23.93	20.31	19.22
14	40.44	30.99	24.62	23.19	22.48	11	21.76	18.46	17.47
15	37.75	28.92	22.98	21.65	20.98	12	19.94	16.92	16.02
16	35.39	27.11	21.55	20.30	19.67	13	18.41	15.62	14.79
17	33.30	25.52	20.28	19.10	18.51	14	17.09	14.51	13.73
18	31.45	24.10	19.15	18.04	17.49	15	15.95	13.54	12.81
19	29.80	22.83	18.14	17.09	16.56	16	14.96	12.69	12.01
20	28.31	21.69	17.24	16.24	15.74	17	14.08	11.95	11.31
21	26.96	20.66	16.42	15.46	14.99	18	13.30	11.28	10.68
22	25.74	19.72	15.67	14.76	14.31	19	12.60	10.69	10.12
23	24.62	18.86	14.99	14.12	13.68	20	11.97	10.15	9.61
24	23.59	18.07	14.36	13.53	13.11	21	11.40	9.67	9.15
25	22.65	17.35	13.79	12.99	12.59	22	10.88	9.23	8.74
26	21.78	16.68	13.26	12.49	12.11	23	10.41	8.83	8.36
27	20.97	16.07	12.77	12.03	11.66	24	9.97	8.46	8.01
28	20.22	15.49	12.31	11.60	11.24	25	9.57	8.12	7.69
29	19.52	14.96	11.89	11.20	10.85	26	9.20	7.81	7.39
30	18.87	14.46	11.49	10.82	10.49	27	8.86	7.52	7.12
31	18.26	13.99	11.12	10.47	10.15	28	8.55	7.25	6.86
32	17.69	13.56	10.77	10.15	9.84	29	8.25	7.00	6.63
33	17.16	13.15	10.45	9.84	9.54	30	7.98	6.77	6.41
34	16.65	12.76	10.14	9.55	9.26	31	7.72	6.55	6.20
35	16.18	12.39	9.85	9.28	8.99	32	7.48	6.35	6.01
36	15.73	12.05	9.58	9.02	8.74	33	7.25	6.15	5.82
37	15.30	11.72	9.32	8.78	8.51	34	7.04	5.97	5.65
	14.90	11.42	9.07	8.55	8.28	35	6.84	5.80	5.49
	14.52	11.12	8.84	8.33	8.07				
	14.15	10.84	8.62	8.12	7.87				

Safe loads given include weight of beam. Maximum fibre stress, 00 lbs. per square inch.

afe loads given below the dotted lines produce deflections exceed- /360 of the span.

rtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM I BEAMS

SAFE LOADS UNIFORMLY DISTRIBUTED IN TONS OF 2000 LBS.

Beams being secured against yielding sideways.

Span in Feet	10″ I B10 28.5 lbs.	10″ I B10 23.5 lbs.	Span in Feet	9″ I B9 24 lbs.	9″ I B9 20 lbs.	8″ I B8 19.5 lbs.	8″ I B8 17.5 lbs.
9	15.95	14.57	5	21.83	20.18	16.16	15.30
10	14.35	13.11	6	18.19	16.81	13.46	12.75
11	13.05	11.92	7	15.60	14.41	11.54	10.93
12	11.96	10.92	8	13.65	12.61	10.10	9.57
13	11.04	10.08	9	12.13	11.21	8.98	8.50
14	10.25	9.36	10	10.92	10.09	8.08	7.65
15	9.57	8.74	11	9.92	9.17	7.34	6.96
16	8.97	8.19	12	9.10	8.41	6.73	6.38
17	8.44	7.71	13	8.40	7.76	6.21	5.89
18	7.97	7.28	14	7.80	7.21	5.77	5.47
19	7.55	6.90	15	7.28	6.73	5.39	5.10
20	7.18	6.55	16	6.82	6.31	5.05	4.78
21	6.84	6.24	17	6.42	5.93	4.75	4.50
22	6.52	5.96	18	6.07	5.61	4.49	4.25
23	6.24	5.70	19	5.75	5.31	4.25	4.03
24	5.98	5.46	20	5.46	5.04	4.04	3.83
25	5.74	5.24	21	5.20	4.80	3.85	3.64
26	5.52	5.04	22	4.96	4.59	3.67	3.48
27	5.32	4.86	23	4.75	4.39	3.51	3.33
28	5.13	4.68	24	4.55	4.20	3.37	3.19
29	4.95	4.52	25	4.37	4.04	3.23	3.06
30	4.78	4.37	26	4.20	3.88		
			27	4.04	3.74		
			28	3.90	3.60		
			29	3.76	3.48		
			30	3.64	3.36		

Safe loads given include weight of beam. Maximum fibre st 16,000 lbs. per square inch.

Safe loads given below the dotted lines produce deflections exc ing 1/360 of the span.

Courtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM GIRDER BEAMS

SAFE LOADS UNIFORMLY DISTRIBUTED IN TONS OF 2000 LBS.

Beams being secured against yielding sideways.

Span	30″ G		28″ G		26″ G	
in	G30 a	G30	G28 a	G28	G26 a	G26
Feet	200 lbs.	180 lbs.	180 lbs.	165 lbs.	160 lbs.	150 lbs.
18	180.75	161.87	153.75	138.89	128.11	117.47
19	171.24	153.35	145.66	131.58	121.37	111.29
20	162.68	145.68	138.38	125.00	115.30	105.72
21	154.93	138.74	131.79	119.05	109.81	100.69
22	147.89	132.44	125.80	113.64	104.82	96.11
23	141.46	126.68	120.33	108.70	100.26	91.93
24	135.56	121.40	115.31	104.17	96.08	88.10
25	130.14	116.55	110.70	100.00	92.24	84.58
26	125.14	112.06	106.44	96.16	88.69	81.32
27	120.50	107.91	102.50	92.60	85.41	78.31
28	116.20	104.06	98.84	89.29	82.36	75.52
29	112.19	100.47	95.43	86.21	79.52	72.91
30	108.45	97.12	92.25	83.34	76.87	70.48
31	104.95	93.99	89.27	80.65	74.39	68.21
32	101.67	91.05	86.48	78.13	72.06	66.08
33	98.59	88.29	83.86	75.76	69.88	64.07
34	95.69	85.70	81.40	73.53	67.82	62.19
35	92.96	83.25	79.07	71.43	65.88	60.41
36	90.38	80.93	76.88	69.45	64.05	58.73
37	87.93	78.75	74.80	67.57	62.32	57.15
38	85.62	76.67	72.83	65.79	60.68	55.64
39	83.42	74.71	70.96	64.10	59.13	54.22
40	81.34	72.84	69.19	62.50	57.65	52.86
41	79.35	71.06	67.50	60.98	56.24	51.57
42	77.47	69.37	65.89	59.53	54.90	50.34
43	75.66	67.76	64.36	58.14	53.63	49.17
	73.94	66.22	62.90	56.82	52.41	48.06
5	72.30	64.75	61.50	55.56	51.24	46.99
6	70.73	63.34	60.16	54.35	50.13	45.97
7	69.22	61.99	58.88	53.19	49.06	44.99
8	67.78	60.70	57.66	52.09	48.04	44.05

fe loads given include weight of beam.
aximum fibre stress, 16,000 lbs. per square inch.

esy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION
BETHLEHEM GIRDER BEAMS
SAFE LOADS UNIFORMLY DISTRIBUTED IN TONS OF 2000 LBS.

Beams being secured against yielding sideways.

Span in Feet	24″ G		20″ G		18″ G
	G24 a	G24	G20 a	G20	G18
	140 lbs.	120 lbs.	140 lbs.	112 lbs.	92 lbs.
12	155.61	133.60	130.43	104.09	78.59
13	143.64	123.33	120.40	96.09	72.54
14	133.38	114.52	111.80	89.23	67.36
15	124.48	106.88	104.34	83.28	62.87
16	116.71	100.20	97.82	78.07	58.94
17	109.84	94.31	92.07	73.48	55.47
18	103.74	89.07	86.95	69.40	52.39
19	98.28	84.38	82.38	65.74	49.63
20	93.37	80.16	78.26	62.46	47.15
21	88.92	76.35	74.53	59.48	44.91
22	84.88	72.88	71.14	56.78	42.87
23	81.19	69.71	68.05	54.31	41.00
24	77.80	66.80	65.22	52.05	39.29
25	74.69	64.15	62.61	49.97	37.72
26	71.82	61.66	60.20	48.04	36.27
27	69.16	59.38	57.97	46.26	34.93
28	66.69	57.26	55.90	44.61	33.68
29	64.39	55.29	53.97	43.07	32.52
30	62.24	53.44	52.17	41.64	31.43
31	60.24	51.72	50.49	40.30	30.42
32	58.35	50.10	48.91	39.04	29.47
33	56.58	48.58	47.43	37.85	28.58
34	54.92	47.15	46.04	36.74	27.74
35	53.35	45.81	44.72	35.69	26.94
36	51.87	44.54	43.48	34.70	26.20
37	50.47	43.33	42.30	33.76	25.49
38	49.14	42.19	41.19	32.87	24.82
39	47.88	41.11	40.13	32.03	24.18
40	46.68	40.08	39.13	31.23	23.58

Safe loads given include weight of beam. Maximum fibre st 16,000 lbs. per square inch.

Loads given above the heavy lines are greater than safe loads web crippling.

Safe loads given below the dotted line produce deflections exc ing 1/360 of the span.

Courtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM GIRDER BEAMS

SAFE LOADS UNIFORMLY DISTRIBUTED IN TONS OF 2000 LBS.

Beams being secured against yielding sideways.

Span in Feet	15″ G			12″ G	
	G15 b	G15 a	G15,	G12 a	G12
	140 lbs.	104 lbs.	73 lbs.	70 lbs.	55 lbs.
10	113.26	86.76	62.83	47.89	38.40
11	102.96	78.88	57.12	43.54	34.91
12	94.38	72.30	52.36	39.91	32.00
13	87.12	66.74	48.33	36.84	29.54
14	80.90	61.97	44.88	34.21	27.43
15	75.51	57.84	41.89	31.93	25.60
16	70.79	54.23	39.27	29.93	24.00
17	66.62	51.04	36.96	28.17	22.59
18	62.92	48.20	34.91	26.61	21.33
19	59.61	45.67	33.07	25.21	20.21
20	56.63	43.38	31.42	23.95	19.20
21	53.93	41.32	29.92	22.81	18.28
22	51.48	39.44	28.56	21.77	17.45
23	49.24	37.72	27.32	20.82	16.69
24	47.19	36.15	26.18	19.95	16.00
25	45.30	34.71	25.13	19.16	15.36
26	43.56	33.37	24.17	18.42	14.77
27	41.95	32.13	23.27	17.74	14.22
28	40.45	30.99	22.44	17.10	13.71
29	39.05	29.92	21.67	16.51	13.24
30	37.75	28.92	20.94	15.96	12.80
31	36.54	27.99	20.27	15.45	12.39
32	35.39	27.11	19.63	14.97	12.00
33	34.32	26.29	19.04	14.51	11.64
34	33.31	25.52	18.48	14.09	11.29
35	32.36	24.79	17.95	13.68	10.97

Safe loads given include weight of beam. Maximum fibre stress, 000 lbs. per square inch.

Load given above the heavy line is greater than a safe load for b crippling.

Safe loads given below the dotted lines produce deflections exceed- 1/360 of the span.

Courtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION
BETHLEHEM GIRDER BEAMS

SAFE LOADS UNIFORMLY DISTRIBUTED IN TONS OF 2000 LBS.

Beams being secured against yielding sideways.

Span in Feet	10″ G G10 44 lbs.	Span in Feet	9″ G G9 38 lbs.	8″ G G8 32.5 lbs.
10	26.05	5	40.50	30.51
11	23.68	6	33.75	25.42
12	21.71	7	28.93	21.79
13	20.04	8	25.31	19.07
14	18.61	9	22.50	16.95
15	17.37	10	20.25	15.25
16	16.28	11	18.41	13.87
17	15.32	12	16.88	12.71
18	14.47	13	15.58	11.73
19	13.71	14	14.47	10.90
20	13.03	15	13.50	10.17
21	12.40	16	12.66	9.53
22	11.84	17	11.91	8.97
23	11.33	18	11.25	8.47
24	10.85	19	10.66	8.03
25	10.42	20	10.13	7.63
26	10.02	21	9.64	7.26
27	9.65	22	9.21	6.93
28	9.30	23	8.80	6.63
29	8.98	24	8.44	6.36
30	8.68	25	8.10	6.10
31	8.40	26	7.79	
32	8.14	27	7.50	
33	7.89	28	7.23	
34	7.66	29	6.98	
35	7.44	30	6.75	

Safe loads given include weight of beam. Maximum fibre st 16,000 lbs. per square inch.

Loads given above the heavy lines are greater than safe loads web crippling.

Safe loads given below the dotted lines produce deflections exc ing 1/360 of the span.

Courtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

STANDARD ROLLED CHANNELS

SAFE LOADS IN POUNDS UNIFORMLY DISTRIBUTED

Safe loads figured for fibre stress of 16,000 lbs. per square inch, and include weight of channel.

Clear Span in Feet	3″ 4.1 lbs.	3″ 5 lbs.	4″ 5.4 lbs.	4″ 6.25 lbs.	5″ 6.7 lbs.	5″ 9 lbs.	Clear Span in Feet
2	5800	6600	10100	11100	15800	18900	2
3	3900	4400	6700	7400	10500	12600	3
4	2900	3300	5100	5600	7900	9500	4
5	2300	2600	4100	4500	6300	7600	5
6	1900	2200	3400	3700	5300	6300	6
7	1700	1900	2900	3200	4500	5400	7
8	1500	1600	2500	2800	4000	4700	8
9			2200	2500	3500	4200	9
10			2000	2200	3200	3800	10
11					2900	3400	11
- -					2600	3200	12

or safe loads below the heavy lines, the deflections will be greater .. the allowable limit for plastered ceilings or 1/360 span.

ırtesy Carnegie Steel Company Pocket Companion, 22nd Edition.

GENERAL INFORMATION
STANDARD ROLLED CHANNELS

SAFE LOADS IN POUNDS UNIFORMLY DISTRIBUTED

Safe loads are figured for fibre stress of 16,000 lbs. per square inch, and include weight of channel.

Clear Span in Feet	6″ 8.2 lbs.	6″ 10.5 lbs.	7″ 9.8 lbs.	7″ 12.25 lbs.	8″ 11.5 lbs.	8″ 13.75 lbs.	Clear Span in Feet
4	11600	13400	16100	18400	21500	24000	4
5	9200	10800	12900	14700	17200	19200	5
6	7700	9000	10700	12300	14400	16000	6
7	6500	7700	9200	10500	12300	13700	7
8	5800	6700	8000	9200	10800	12000	8
9	5100	6000	7100	8200	9600	10700	9
10	4600	5400	6400	7400	8600	9600	10
11	4200	4900	5800	6700	7800	8700	11
12	3900	4500	5400	6100	7200	8000	12
13	3600	4100	4900	5700	6600	7400	13
14	3300	3800	4600	5300	6200	6900	14
15			4300	4900	5700	6400	15
16			4000	4600	5400	6000	16
17					5100	5600	1
18					4800	5300	1

For safe loads below the heavy lines, the deflections will be gr[illegible]r than the allowable limit for plastered ceilings or 1/360 span.

Courtesy Carnegie Steel Company Pocket Companion, 22nd Edition.

GENERAL INFORMATION
STANDARD ROLLED CHANNELS

SAFE LOADS IN POUNDS UNIFORMLY DISTRIBUTED

Safe loads are figured for fibre stress of 16,000 lbs. per square inch and include weight of channel.

Clear Span in Feet	9″ 13.4 lbs.	9″ 15 lbs.	10″ 15.3 lbs.	10″ 20 lbs.	12″ 20.7 lbs.	15″ 33.9 lbs.	Clear Span in Feet
12	9300	10100	11900	14000	19000	37000	12
13	8600	9300	11000	12900	17500	34200	13
14	8000	8600	10200	12000	16300	31800	14
15	7500	8000	9500	11200	15200	29600	15
16	7000	7500	8900	10500	14200	27800	16
17	6600	7100	8400	9900	13400	26100	17
18	6200	6700	7900	9300	12700	24700	18
19	5900	6300	7500	8800	12000	23400	19
20	5600	6000	7100	8400	11400	22300	20
21			6800	8000	10800	21200	21
22			6500	7600	10400	20200	22
23					9900	19300	23
24					9500	18500	24
25					9100	17800	25
26					8800	17100	26
27						16500	27
28						15900	28
29						15300	29
)						14800	30
l						14300	31
2						13900	32

For safe loads below the heavy lines, the deflections will be greater t the allowable limit for plastered ceilings or 1/360 span.

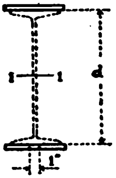
urtesy Carnegie Steel Company Pocket Companion, 22nd Edition.

GENERAL INFORMATION

SHEET A

SIMPLE METHOD OF COMPUTING APPROXIMATE STRENGTH OF STEEL BEAMS WITH ADDITION OF TOP AND BOTTOM PLATES

Table giving Moment of Inertia "I" of Two Plates in sections 1" wide, about Axis 1-1. Based on Distance "d".



For total Moment of Inertia, deduct Rivet Holes from Width of Plates, and multiply this Net Width by the Tabular Value.

d	THICKNESS OF PLATE IN INCHES							d
inches	¼	⅜	½	⅝	¾	⅞	1	inches
5	3.4	5.4	7.6	9.9	12.5	15.2	18.2	5
6	4.9	7.6	10.6	13.8	17.2	20.7	24.7	6
7	6.6	10.2	14.1	18.2	22.6	27.2	32.2	7
8	8.5	13.2	18.1	23.3	28.8	34.6	40.7	8
9	10.7	16.5	22.6	29.0	35.7	42.8	50.2	9
10	13.1	20.2	27.6	35.3	43.4	51.9	60.7	10
12	18.8	28.7	39.1	49.8	61.0	72.6	84.7	12
15	29.1	44.3	60.1	76.3	93.1	110.4	128.2	15
18	41.6	63.3	85.6	108.5	131.9	156.0	180.7	18
20	51.3	77.9	105.1	133.0	161.5	190.8	220.6	20
21	56.4	85.7	115.6	146.2	177.5	209.5	242.2	21
24	73.5	111.4	150.1	189.5	229.8	270.8	312.7	24
26	86.1	130.4	175.6	221.6	268.4	316.1	364.7	26
27	92.8	140.4	189.1	238.5	288.8	340.1	392.2	27
28	99.7	151.0	203.1	256.1	310.0	364.9	420.7	28
30	114.4	173.0	232.7	293.1	354.7	417.2	480.7	30

USE OF TABLE

Required to develop a Section Modulus (I/C) of 60, by using a 12" 31.8 Lb. I-Beam with Plates added to the Top and Bottom Flanges.

Solution:—"I" of 12"-31.8 Lbs. I-Beam (Axis 1-1) (See table on following page) = ? 8

Assume two plates ⅜"x7½". Deduct 1½" for 2-¾" Rivets.

"I" of Net Plates = 6x28.7 (See above table) = 1 2

Total 3)

Distance from Axis 1-1 to outer fibre = 6⅜".

Therefore Sect. Mod. or I/C for Beam and Plates = 388 ÷ 6.375 =)

Since 60 is required, the assumed Plates answer.

GENERAL INFORMATION

SHEET B

SIMPLE METHOD OF COMPUTING APPROXIMATE STRENGTH OF STEEL BEAMS WITH ADDITION OF TOP AND BOTTOM PLATES

(Note:—This table to be used in conjunction with table on sheet A.)

Moment of Inertia (I) of Standard I-Beams, Bethlehem I and Girder Beams. (Axis 1-1.)

Std. I-Beam			Beth. I-Beam			Beth. I-Beam			Beth. G-Beam		
Size	Wt.	I	Size	Wt.	I	Size	Wt.	I	Size	Wt.	I
5	10.0	12.1	8	17.5	57.4	20	72.0	1466.5	8	32.5	114.4
5	12.25	13.5	8	19.5	60.6	20	82.0	1559.8	9	38.0	170.9
6	12.5	21.8	9	20.0	85.1	24	73.0	2091.0	10	44.0	244.2
6	14.75	23.8	9	24.0	92.1	24	83.0	2240.9	12	55.0	432.0
7	15.3	36.2	10	23.5	122.9	24	84.0	2381.9	12	70.0	538.8
7	17.5	38.9	10	28.5	134.6	26	90.0	2977.2	15	73.0	883.4
8	18.4	56.9	12	28.5	216.2	28	105.0	4014.1	15	104.0	1220.1
8	20.5	60.2	12	32.0	228.5	30	120.0	5239.6	15	140.0	1592.7
9	21.8	84.9	12	36.0	269.2				18	92.0	1591.4
9	25.0	91.4	15	38.0	442.6				20	112.0	2342.1
10	25.4	122.1	15	41.0	456.7				20	140.0	2934.7
10	30.0	133.5	15	46.0	484.8				24	120.0	3607.3
12	31.8	215.8	15	54.0	610.0				24	140.0	4201.4
12	35.0	227.	15	64.0	664.9				26	150.0	5153.9
15	42.9	441.8	15	71.0	796.2				26	160.0	5620.8
15	45.0	453.6	18	48.5	798.3				28	165.0	6562.7
18	54.7	795.5	18	52.0	825.0				28	180.0	7264.7
18	60.0	837.8	18	54.0	842.0				30	180.0	8194.5
20	55.4	1169.5	18	59.0	883.3				30	200.0	9150.6
20	70.0	1214.2	20	59.0	1172.2						
24	[illegible].9	2087.2	20	64.0	1222.1						
24	[illegible].0	2159.8	20	69.0	1268.9						

GENERAL INFORMATION

BETHLEHEM I BEAMS

SAFE LOADS, IN TONS OF 2000 LBS.

USED AS COLUMNS. SQUARE ENDS

Section Number	Depth of Beam ins.	Wt. per Foot lbs.	Area of Sect. sq. in.	Least Rad. of Gyration ins.	Unsupported Length of Columns					
					5 Ft.	6 Ft.	7 Ft.	8 Ft.	9 Ft.	10 Ft.
B30	30	120.0	35.30	2.16	229.5	229.5	229.5	229.5	229.5	228.5
B28	28	105.0	30.88	2.06	200.7	200.7	200.7	200.7	200.7	197.6
B26	26	90.0	26.49	1.95	172.2	172.2	172.2	172.2	171.6	167.1
B24 a	24	84.0	24.80	1.92	161.2	161.2	161.2	161.2	160.0	155.8
B24	24	83.0	24.59	1.78	159.9	159.9	159.9	159.9	155.7	151.2
	24	73.0	21.47	1.86	139.6	139.6	139.6	139.6	137.5	133.7
B20 a	20	82.0	24.17	1.82	157.1	157.1	157.1	157.1	153.9	149.5
	20	72.0	21.37	1.88	138.9	138.9	138.9	138.9	137.2	133.5
B20	20	69.0	20.26	1.59	131.7	131.7	131.7	128.4	124.2	120.0
	20	64.0	18.86	1.62	122.6	122.6	122.6	120.1	116.3	112.5
	20	59.0	17.36	1.66	112.8	112.8	122.8	111.3	107.8	104.4
B18	18	59.0	17.40	1.50	113.1	112.4	112.4	108.6	104.8	100.9
	18	54.0	15.87	1.54	103.2	103.2	103.2	99.8	96.4	93.0
	18	52.0	15.24	1.56	99.1	99.1	99.1	96.2	92.9	89.7
	18	48.5	14.25	1.59	92.7	92.7	92.7	90.4	87.4	84.5
B15 b	15	71.0	20.95	1.71	136.2	136.2	136.2	135.3	131.2	127.2
B15 a	15	64.0	18.81	1.49	122.3	122.3	121.3	117.1	113.0	108.8
	15	54.0	15.88	1.55	103.2	103.2	103.2	100.0	96.6	93.3
B15	15	46.0	13.52	1.36	87.9	87.9	85.2	81.9	78.6	75.3
	15	41.0	12.02	1.41	78.1	78.1	76.5	73.6	70.8	68.0
	15	38.0	11.27	1.44	73.2	73.2	72.1	69.5	66.9	64.3
B12 a	12	36.0	10.61	1.42	69.0	69.0	67.6	65.2	62.7	60.2
B12	12	32.0	9.44	1.30	61.4	61.2	58.8	56.4	54.0	51.6
	12	28.5	8.42	1.35	54.8	54.8	53.0	50.9	48.9	46.8
B10	10	28.5	8.34	1.21	54.2	53.0	50.8	48.5	46.2	44.0
	10	23.5	6.94	1.27	45.1	44.7	42.9	41.1	39.3	37.5
B9	9	24.0	7.04	1.12	45.8	43.9	41.8	39.7	37.7	35.6
	9	20.0	6.01	1.17	39.1	37.9	36.2	34.5	32.8	[illegible].1
B8	8	19.5	5.78	1.08	37.4	35.6	33.9	32.1	30.3	[illegible].6
	8	17.5	5.18	1.11	33.6	32.2	30.6	29.1	27.6	[illegible].0

Beams not secured against yielding sideways and free to fail in direction [illegible]ist radius of gyration.

Courtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM I BEAMS

SAFE LOADS, IN TONS OF 2000 LBS.

USED AS COLUMNS. SQUARE ENDS

Unsupported Length of Columns										Section Number
11 Ft.	12 Ft.	13 Ft.	14 Ft.	15 Ft.	16 Ft.	18 Ft.	20 Ft.	22 Ft.	24 Ft.	
223.1	217.7	212.3	206.9	201.5	196.1	185.3	174.6	163.8	153.0	B30
192.6	187.7	182.7	177.8	172.9	167.9	158.0	148.1	138.2	128.3	B28
162.6	158.1	153.6	149.1	144.7	140.2	131.2	122.3	113.3	104.3	B26
151.5	147.2	143.0	138.7	134.4	130.2	121.7	113.1	104.6	96.1	B24 a
146.6	142.0	137.5	132.9	128.4	123.8	114.7	105.6	96.4	......	B24
129.9	126.1	122.3	118.5	114.6	110.8	103.2	95.6	88.0	......	
145.2	140.8	136.4	132.0	127.6	123.2	114.5	105.7	97.0	......	B20 a
129.7	126.0	122.2	118.5	114.7	111.0	103.4	95.9	88.4	......	
115.8	111.6	107.4	103.2	99.0	94.8	86.4	78.0	......	......	B20
108.6	104.8	100.9	97.1	93.3	89.4	81.7	74.0	......	......	
100.9	97.5	94.0	90.6	87.1	83.7	76.8	69.9	......	......	
97.1	93.3	89.5	85.6	81.8	78.0	70.3	62.7	......	......	B18
89.6	86.2	82.8	79.4	76.0	72.6	65.8	59.0	......	......	
86.5	83.3	80.0	76.8	73.6	70.4	63.9	57.5	......	......	
81.5	78.5	75.6	72.6	69.7	66.7	60.8	54.9	......	......	
123.1	119.1	115.0	111.0	107.0	102.9	94.8	86.7	......	......	B15 b
104.6	100.5	96.3	92.1	88.0	83.8	75.5	67.2	......	......	B15 a
89.9	86.5	83.1	79.7	76.3	73.0	66.2	59.4	......	......	
72.1	68.8	65.5	62.2	58.9	55.7	49.1	......	......	......	B15
65.2	62.4	59.6	56.8	54.0	51.1	45.5	......	......	......	
61.7	59.2	56.6	54.0	51.4	48.8	43.7	......	......	......	
57.8	55.3	52.8	50.4	47.9	45.4	40.5	......	......	......	B12 a
49.2	46.8	44.4	42.0	39.6	37.2	......	......	......	......	B12
44.7	42.7	40.6	38.6	36.5	34.4	......	......	......	......	
41.7	39.4	37.1	34.9	32.6	30.3	......	......	......	......	B10
35.7	33.9	32.1	30.3	28.5	26.6	......	......	......	......	
[illegible]	31.4	29.4	27.3	25.2						B9
[illegible]	27.7	26.0	24.3	22.7						
[illegible]	25.0	23.3	21.5	......						B8
[illegible]	22.9	21.4	19.9	......						

Allowable stress per sq. inch:
13,000 lbs. for lengths under 55 radii.
16,000—55 l/r for lengths over 55 radii.

...ls given to the right of the zigzag line are for lengths greater than 125 radii of ...n.

...y Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM GIRDER BEAMS

SAFE LOADS, IN TONS OF 2000 LBS.
USED AS COLUMNS. SQUARE ENDS

Allowable stress per square inch: 13,000 lbs. for lengths under 55 radii.
16,000—55 l/r for lengths over 55 radii.

Section Number	Depth of Beam ins.	Wt. per Foot lbs.	Area of Sect. sq. in.	Least Rad. of Gyration ins.	Unsupported Length of Columns, in Feet					
					8 Ft.	9 Ft.	10 Ft.	11 Ft.	12 Ft.	13 Ft.
G30 a	30	200.0	58.71	3.28	381.6	381.6	381.6	381.6	381.6	381.6
G30	30	180.0	53.00	2.86	344.5	344.5	344.5	344.5	344.5	344.5
G28 a	28	180.0	52.86	3.18	343.6	343.6	343.6	343.6	343.6	343.6
G28	28	165.0	48.47	2.77	315.1	315.1	315.1	315.1	315.1	312.7
G26 a	26	160.0	46.91	3.05	304.9	304.9	304.9	304.9	304.9	304.9
G26	26	150.0	43.94	2.68	285.6	285.6	285.6	285.6	285.6	281.2
G24 a	24	140.0	41.16	2.90	267.5	267.5	267.5	267.5	267.5	267.5
G24	24	120.0	35.38	2.66	230.0	230.0	230.0	230.0	230.0	225.8
G20 a	20	140.0	41.19	2.91	267.8	267.8	267.8	267.8	267.8	267.8
G20	20	112.0	32.81	2.70	213.3	213.3	213.3	213.3	213.3	210.4
G18	18	92.0	27.12	2.59	176.3	176.3	176.3	176.3	175.5	172.0
G15 b	15	140.0	41.27	2.83	268.2	268.2	268.2	268.2	268.2	267.6
G15 a	15	104.0	30.50	2.64	198.3	198.3	198.3	198.3	198.3	194.4
G15	15	73.0	21.49	2.39	139.7	139.7	139.7	139.3	136.3	133.4
G12 a	12	70.0	20.58	2.36	133.8	133.8	133.8	133.0	130.1	127.3
G12	12	55.0	16.18	2.24	105.2	105.2	105.2	103.2	100.9	98.5
G10	10	44.0	12.95	2.10	84.1	84.1	83.2	81.2	79.2	77.1
G9	9	38.0	11.22	1.98	72.9	72.9	71.1	69.2	67.3	[illegible]5.4
G8	8	32.5	9.54	1.86	62.0	61.1	59.4	57.7	56.0	[illegible]4.3

Beams not secured against yielding sideways and free to fail in directior ... ast radius of gyration.

Courtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM GIRDER BEAMS

SAFE LOADS, IN TONS OF 2000 LBS.
USED AS COLUMNS. SQUARE ENDS

Allowable stress per square inch: 13,000 lbs. for lengths under 55 radii. 16,000—55 l/r for lengths over 55 radii.

Unsupported Length of Columns in Feet										Section Number
14 Ft.	15 Ft.	16 Ft.	18 Ft.	20 Ft.	22 Ft.	24 Ft.	28 Ft.	32 Ft.	36 Ft.	
381.6	381.6	375.2	363.4	351.5	339.7	327.9	304.3	280.7	257.0	G30 a
338.4	332.3	326.2	313.9	301.7	289.5	277.2	252.8	228.3	203.9	G30
343.6	340.6	335.1	324.1	313.1	302.2	291.2	269.3	247.3	225.4	G28 a
306.9	301.1	295.4	283.8	272.3	260.7	249.2	226.1	203.0	179.9	G28
304.2	299.2	294.1	283.9	273.8	263.6	253.5	233.2	212.9	192.6	G26 a
275.8	270.4	265.0	254.1	243.3	232.5	221.7	200.0	178.4	156.8	G26
263.7	259.0	254.3	245.0	235.6	226.2	216.9	198.1	179.4	160.7	G24 a
221.4	217.0	212.6	203.8	194.9	186.1	177.3	159.7	142.1	124.4	G24
264.1	259.5	254.8	245.5	236.1	226.8	217.4	198.8	180.1	161.4	G20 a
206.4	202.3	198.3	190.3	182.3	174.3	166.2	150.2	134.2	......	G20
168.6	165.1	161.7	154.8	147.9	140.9	134.0	120.2	106.4	......	G18
262.8	258.0	253.2	243.5	233.9	224.3	214.7	195.4	176.2	......	G15 b
190.6	186.8	183.0	175.4	167.8	160.1	152.5	137.3	122.0	......	G15 a
130.4	127.4	124.5	118.5	112.6	106.7	100.7	88.9	......	......	G15
124.4	121.5	118.6	112.9	107.1	101.4	95.6	84.1	......	......	G12 a
96.1	93.7	91.3	86.6	81.8	77.0	72.3	62.7	......	......	G12
75.1	73.1	71.0	67.0	62.9	58.8	54.7	......	......	......	G10
63.6	61.7	59.8	56.1	52.4	48.6	44.9	......	......	......	G9
[illegible]	51.0	49.3	45.9	42.5	39.1	35.7	......	......	......	G8

ɔads given to the right of the zigzag line are for lengths greater than 125 radii
o ⁻ɿtion.

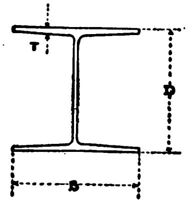
rtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM ROLLED STEEL 14″ H COLUMNS

SQUARE ENDS

SAFE LOADS, IN TONS OF 2000 LBS.



Allowable stress per square inch:
13,000 lbs. for lengths under 55 radii.
16,000—55 l/r for lengths over 55 radii.

Sect. No.	Wt. of Sect. lbs. per ft.	Dimensions Inches			Area of Sect. sq. in.	Least Rad. of Gyration in.	Unsupported Length of Columns				
		D	T	B			10 Ft.	12 Ft.	14 Ft.	16 Ft.	18 Ft.
	83.5	13¾	11/16	13.92	24.46	3.47	159.0	159.0	159.0	158.5	153.8
	91.0	13⅞	¾	13.96	26.76	3.49	173.9	173.9	173.9	173.9	168.5
	99.0	14	13/16	14.00	29.06	3.50	188.9	188.9	188.9	188.6	183.2
	106.5	14⅛	⅞	14.04	31.38	3.52	204.0	204.0	204.0	204.0	198.1
	114.5	14¼	15/16	14.08	33.70	3.53	219.1	219.1	219.1	219.1	212.9
	122.5	14⅜	1	14.12	36.04	3.55	234.3	234.3	234.3	234.3	228.0
	130.5	14½	1 1/16	14.16	38.38	3.56	249.5	249.5	249.5	249.5	243.0
	138.0	14⅝	1⅛	14.19	40.59	3.58	263.8	263.8	263.8	263.8	257.4
	146.0	14¾	1 3/16	14.23	42.95	3.59	279.2	279.2	279.2	279.2	272.5
	154.0	14⅞	1¼	14.27	45.33	3.61	294.7	294.7	294.7	294.7	288.1
	162.0	15	1 5/16	14.31	47.71	3.62	310.1	310.1	310.1	310.1	303.4
H14	170.5	15⅛	1⅜	14.35	50.11	3.64	325.7	325.7	325.7	325.7	319.0
	178.5	15¼	1 7/16	14.39	52.51	3.65	341.3	341.3	341.3	341.3	334.6
	186.5	15⅜	1½	14.43	54.92	3.66	357.0	357.0	357.0	357.0	350.3
	195.0	15½	1 9/16	14.47	57.35	3.68	372.8	372.8	372.8	372.8	366.1
	203.5	15⅝	1⅝	14.51	59.78	3.69	388.6	388.6	388.6	388.6	381.9
	211.0	15¾	1 11/16	14.54	62.07	3.70	403.5	403.5	403.5	403.5	396.9
	219.5	15⅞	1¾	14.58	64.52	3.71	419.4	419.4	419.4	419.4	412.9
	227.5	16	1 13/16	14.62	66.98	3.72	435.4	435.4	435.4	435.4	429.0
	236.0	16⅛	1⅞	14.66	69.45	3.74	451.4	451.4	451.4	451.4	445.2
	244.5	16¼	1 15/16	14.70	71.94	3.75	467.6	467.6	467.6	467.6	[illegible].5
	253.0	16⅜	2	14.74	74.43	3.76	483.8	483.8	483.8	483.8	[illegible].9
	261.5	16½	2 1/16	14.78	76.93	3.77	500.0	500.0	500.0	500.0	[illegible].4
	270.0	16⅝	2⅛	14.82	79.44	3.79	516.4	516.4	516.4	516.4	[illegible].9
	278.5	16¾	2 3/16	14.86	81.97	3.80	532.8	532.8	532.8	532.8	5[illegible].6
	287.5	16⅞	2¼	14.90	84.50	3.81	549.3	549.3	549.3	549.3	[illegible].3

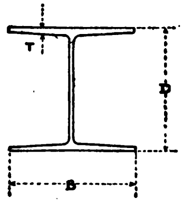
Courtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM ROLLED STEEL 14″ H COLUMNS

SQUARE ENDS

SAFE LOADS, IN TONS OF 2000 LBS.



Allowable stress per square inch:
13,000 lbs. for lengths under 55 radii.
16,000—55 l/r for lengths over 55 radii.

Unsupported Length of Columns										Weight of Sect., lbs. per foot
20 Ft.	22 Ft.	24 Ft.	26 Ft.	28 Ft.	30 Ft.	32 Ft.	36 Ft.	40 Ft.	44 Ft.	
149.2	144.5	139.9	135.2	130.5	125.9	121.2	111.9	102.6	......	83.5
163.4	158.4	153.3	148.2	143.2	138.1	133.1	122.9	112.8	......	91.0
177.7	172.2	166.7	161.2	155.8	150.3	144.8	133.8	122.9	111.9	99.0
192.2	186.3	180.4	174.6	168.7	162.8	156.9	145.1	133.4	121.6	106.5
206.6	200.3	194.0	187.7	181.4	175.1	168.8	156.2	143.6	131.0	114.5
221.3	214.6	207.9	201.2	194.5	187.8	181.1	167.7	154.3	140.9	122.5
235.9	228.8	221.7	214.5	207.4	200.3	193.2	179.0	164.7	150.5	130.5
249.9	242.4	234.9	227.4	220.0	212.5	205.0	190.0	175.1	160.1	138.0
264.6	256.7	248.9	241.0	233.1	225.2	217.3	201.5	185.7	170.0	146.0
279.8	271.5	263.2	254.9	246.6	238.3	230.0	213.5	196.9	180.3	154.0
294.7	286.0	277.3	268.6	259.9	251.2	242.5	225.1	207.7	190.3	162.0
309.9	300.8	291.7	282.6	273.5	264.4	255.3	237.1	218.9	200.7	170.5
325.1	315.6	306.1	296.6	287.1	277.6	268.1	249.1	230.1	211.1	178.5
340.3	330.5	320.6	310.7	300.8	290.9	281.0	261.2	241.4	221.6	186.5
355.8	345.5	335.2	324.9	314.6	304.3	294.0	273.4	252.8	232.2	195.0
371.2	360.5	349.8	339.1	328.4	317.7	307.0	285.6	264.2	242.8	203.5
385.8	374.8	363.7	352.6	341.6	330.5	319.4	297.3	275.1	253.0	211.0
401.4	390.0	378.5	367.1	355.6	344.1	332.6	309.7	286.8	263.8	219.5
417.2	405.3	393.4	381.6	369.7	357.8	345.9	322.2	298.5	274.8	227.5
433.0	420.7	408.4	396.2	383.9	371.6	359.4	334.8	310.3	285.8	236.0
44[illegible]	436.2	423.6	410.9	398.2	385.6	372.9	347.6	322.2	296.9	244.5
46[illegible]	451.8	438.7	425.7	412.6	399.6	386.5	360.4	334.3	308.1	253.0
48[illegible]	467.4	454.0	440.5	427.1	413.6	400.2	373.3	346.4	319.5	261.5
49[illegible]	483.2	469.3	455.5	441.6	427.8	413.9	386.3	358.6	330.9	270.0
51[illegible]	499.1	484.8	470.6	456.3	442.1	427.8	399.4	370.9	342.4	278.5
52[illegible]	515.0	500.4	485.7	471.1	456.4	441.8	412.5	383.3	354.0	287.5

s to the right of the heavy line are for lengths greater than 125 radii.

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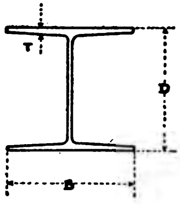
GENERAL INFORMATION



BETHLEHEM ROLLED STEEL 12″ H COLUMNS

SQUARE ENDS

SAFE LOADS, IN TONS OF 2000 LBS.

Allowable stress per square inch:
13,000 lbs. for lengths under 55 radii.
16,000—55 l/r for lengths over 55 radii.

Sect. No.	Wt. of Sect. lbs. per ft.	Dimensions Inches			Area of Sect. sq. in.	Least Rad. of Gyration in.	Unsupported Length of Columns				
		D	T	B			10 Ft.	12 Ft.	14 Ft.	16 Ft.	18 Ft.
	64.5	11¾	5/8	11.92	19.00	2.98	123.5	123.5	122.5	118.3	114.1
	71.5	11⅞	11/16	11.96	20.96	3.00	136.2	136.2	135.4	130.8	126.2
	78.0	12	¾	12.00	22.94	3.01	149.1	149.1	148.3	143.3	138.3
	84.5	12⅛	13/16	12.04	24.92	3.03	162.0	162.0	161 4	155.9	150.5
	91.5	12¼	⅞	12.08	26.92	3.04	175.0	175.0	174.5	168.6	162.8
	98.5	12⅜	15/16	12.12	28.92	3.06	188.0	188.0	187.7	181.5	175.2
H12	105.0	12½	1	12.16	30.94	3.07	201.1	201.1	201.0	194.3	187.7
	112.0	12⅝	1 1/16	12.20	32.96	3.08	214.2	214.2	214.2	207.2	200.1
	118.5	12¾	1⅛	12.23	34.87	3.10	226.7	226.7	226.7	219.6	212.1
	125.5	12⅞	1 3/16	12.27	36.91	3.11	239.9	239.9	239.9	232.6	224.8
	132.5	13	1¼	12.31	38.97	3.13	253.3	253.3	253.3	246.0	237.8
	139.5	13⅛	1 5/16	12.35	41.03	3.14	266.7	266.7	266.7	259.3	250.6
	146.5	13¼	1⅜	12.39	43.10	3.15	280.2	280.2	280.2	272.6	[illegible]
	153.5	13⅜	1 7/16	12.43	45.19	3.16	293.7	293.7	293.7	286.0	[illegible]
	161.0	13½	1½	12.47	47.28	3.18	307.3	307.3	307.3	299.7	[illegible]

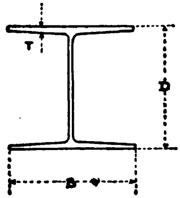
Courtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM ROLLED STEEL
12″ H COLUMNS

SQUARE ENDS

SAFE LOADS, IN TONS OF 2000 LBS.



Allowable stress per square inch:
13,000 lbs. for lengths under 55 radii.
16,000—55 l/r for lengths over 55 radii.

Unsupported Length of Columns										Weight of Sect. lbs. per ft.
20 Ft.	22 Ft.	24 Ft.	26 Ft.	28 Ft.	30 Ft.	32 Ft.	34 Ft.	36 Ft.	38 Ft.	
109.9	105.7	101.5	97.3	93.1	88.9	84.7	80.5	76.3	......	64.5
121.6	117.0	112.4	107.8	103.1	98.5	93.9	89.3	84.7	......	71.5
133.2	128.2	123.2	118.1	113.1	108.1	103.0	98.0	93.0	......	78.0
145.1	139.7	134.2	128.8	123.4	117.9	112.5	107.1	101.7	......	84.5
156.9	151.1	145.2	139.4	133.5	127.7	121.9	116.0	110.2	104.3	91.5
169.0	162.8	156.5	150.3	144.0	137.8	131.6	125.3	119.1	112.8	98.5
181.0	174.4	167.7	161.1	154.4	147.8	141.1	134.4	127.8	121.1	105.0
193.1	186.0	178.9	171.9	164.8	157.7	150.7	143.6	136.6	129.5	112.0
204.7	197.3	189.9	182.5	175.0	167.6	160.2	152.8	145.3	137.9	118.5
217.0	209.1	201.3	193.5	185.6	177.8	170.0	162.1	154.3	146.5	125.5
229.6	221.4	213.2	204.9	196.7	188.5	180.3	172.1	163.9	155.6	132.5
24[illegible]	233.4	224.8	216.1	207.5	198.9	190.3	181.6	173.0	164.4	139.5
2[illegible]	245.5	236.4	227.4	218.4	209.3	200.3	191.3	182.3	173.2	146.5
2[illegible]	257.7	248.3	238.8	229.4	219.9	210.5	201.1	191.6	182.2	153.5
2[illegible]	270.3	260.5	250.7	240.9	231.0	221.2	211.4	201.6	191.8	161.0

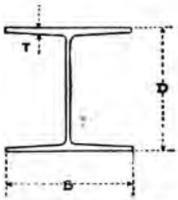
[illegible]s to the right of the heavy line are for lengths greater than 125 radii.
[illegible]esy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM ROLLED STEEL 10″ H COLUMNS

SQUARE ENDS

SAFE LOADS, IN TONS OF 2000 LBS.



Allowable stress per square inch:
13,000 lbs. for lengths under 55 radii.
16,000—55 l/r for lengths over 55 radii.

Sect. No.	Wt. of Sect. lbs. per ft.	Dimensions Inches			Area of Sect. sq. in.	Least Rad. of Gyration in.	Unsupported Length of Columns				
		D	T	B			10 Ft.	11 Ft.	12 Ft.	13 Ft.	14 Ft.
	49.0	9⅞	$\frac{9}{16}$	9.97	14.37	2.49	93.5	93.5	92.1	90.2	88.3
	54.0	10	⅝	10.00	15.91	2.51	103.4	103.4	102.2	100.1	98.0
	59.5	10⅛	$\frac{11}{16}$	10.04	17.57	2.53	114.2	114.2	113.1	110.8	108.5
	65.5	10¼	¾	10.08	19.23	2.54	125.0	125.0	123.9	121.4	118.9
	71.0	10⅜	$\frac{13}{16}$	10.12	20.91	2.56	135.9	135.9	134.9	132.2	129.5
	77.0	10½	⅞	10.16	22.59	2.57	146.8	146.8	145.9	143.0	140.1
H10	82.5	10⅝	$\frac{15}{16}$	10.20	24.29	2.58	157.9	157.9	157.0	153.9	150.8
	88.5	10¾	1	10.24	25.99	2.60	168.9	168.9	168.3	165.0	161.7
	94.0	10⅞	$1\frac{1}{16}$	10.28	27.71	2.61	180.1	180.1	179.6	176.1	172.6
	99.5	11	1⅛	10.31	29.32	2.62	190.6	190.6	190.2	186.6	182.9
	105.5	11⅛	$1\frac{3}{16}$	10.35	31.06	2.64	201.9	201.9	201.9	198.0	194.1
	111.5	11¼	1¼	10.39	32.80	2.65	213.2	213.2	213.2	209.3	205.2
	117.5	11⅜	$1\frac{5}{16}$	10.43	34.55	2.66	224.6	224.6	224.6	220.7	[illegible]
	123.5	11½	1⅜	10.47	36.32	2.67	236.1	236.1	236.1	232.2	[illegible]

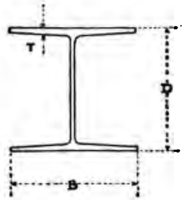
Courtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM ROLLED STEEL 10″ H COLUMNS

SQUARE ENDS

SAFE LOADS, IN TONS OF 2000 LBS.



Allowable stress per square inch:
13,000 lbs. for lengths under 55 radii.
16,000—55 l/r for lengths over 55 radii.

Unsupported Length of Columns										Weight of Sect., lbs. per ft.
15 Ft.	16 Ft.	18 Ft.	20 Ft.	22 Ft.	24 Ft.	26 Ft.	28 Ft.	30 Ft.	32 Ft.	
86.3	84.5	80.7	76.9	73.1	69.3	65.4	61.6	57.8	54.0	49.0
95.9	93.8	89.6	85.4	81.3	77.1	72.9	68.7	64.5	60.3	54.0
106.2	103.9	99.3	94.7	90.1	85.6	81.0	76.4	71.8	67.2	59.5
116.4	113.9	108.9	103.9	98.9	93.9	88.9	83.9	78.9	73.9	65.5
126.9	124.2	118.8	113.4	108.0	102.6	97.2	91.8	86.4	80.1	71.0
137.2	134.3	128.5	122.7	116.9	111.1	105.3	99.5	93.7	87.9	77.0
147.7	144.6	138.4	132.2	126.0	119.8	113.5	107.3	101.1	94.9	82.5
158.4	155.1	148.5	142.0	135.4	128.8	122.2	115.6	109.0	102.4	88.5
169.1	165.6	158.6	151.6	144.6	137.6	130.6	123.6	116.6	109.6	94.0
179.2	175.5	168.1	160.7	153.3	145.9	138.5	131.2	123.8	116.4	99.5
190.3	186.4	178.6	170.8	163.1	155.3	147.5	139.8	132.0	124.2	105.5
201.2	197.0	188.9	180.7	172.5	164.4	156.2	148.0	139.9	131.7	111.5
2	207.8	199.2	190.7	182.1	173.5	165.0	156.4	147.8	139.2	117.5
2	218.7	209.8	200.8	191.8	182.8	173.8	164.9	155.9	146.9	123.5

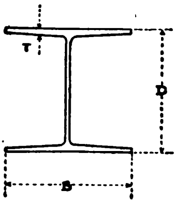
s to the right of the heavy line are for lengths greater than 125 radii.

tesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM ROLLED STEEL 8″ H COLUMNS

SQUARE ENDS



SAFE LOADS, IN TONS OF 2000 LBS.

Allowable stress per square inch:
13,000 lbs. for lengths under 55 radii.
16,000—55 l/r for lengths over 55 radii.

Sect. No.	Wt. of Sect. lbs. per ft.	Dimensions Inches D	Dimensions Inches T	Dimensions Inches B	Area of Sect. sq. in.	Least Rad. of Gyration in.	Unsupported Length of Columns 8 Ft.	9 Ft.	10 Ft.	11 Ft.	12 Ft.
H8	32.0	7⅞	7/16	8.00	9.17	1.98	59.7	59.7	58.1	56.5	55.0
	34.5	8	½	8.00	10.17	2.01	66.1	66.1	64.7	63.0	61.3
	39.0	8⅛	9/16	8.04	11.50	2.03	74.8	74.8	73.3	71.4	69.6
	43.5	8¼	⅝	8.08	12.83	2.04	83.4	83.4	81.9	79.8	77.7
	48.0	8⅜	11/16	8.12	14.18	2.05	92.2	92.2	90.6	88.3	86.1
	53.0	8½	¾	8.16	15.53	2.07	101.0	101.0	99.5	97.0	94.5
	57.5	8⅝	13/16	8.20	16.90	2.08	109.9	109.9	108.4	105.7	103.0
	62.0	8¾	⅞	8.24	18.27	2.09	118.8	118.8	117.3	114.4	111.5
	67.0	8⅞	15/16	8.28	19.66	2.11	127.8	127.8	126.5	123.5	120.4
	71.5	9	1	8.32	21.05	2.12	136.8	136.8	135.6	132.4	129.1
	76.5	9⅛	1 1/16	8.36	22.46	2.13	146.0	146.0	144.9	141.4	137.9
	81.0	9¼	1⅛	8.39	23.78	2.14	154.6	154.6	153.6	149.9	146.2
	85.5	9⅜	1 3/16	8.43	25.20	2.16	163.8	163.8	163.1	159.3	155.4
	90.5	9½	1¼	8.47	26.64	2.17	173.2	173.2	172.6	168.6	[illegible].5

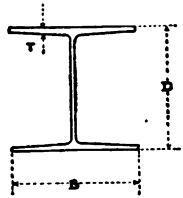
Courtesy Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

BETHLEHEM ROLLED STEEL 8″ H COLUMNS

SQUARE ENDS

SAFE LOADS, IN TONS OF 2000 LBS.



Allowable stress per square inch:
13,000 lbs. for lengths under 55 radii.
16,000—55 l/r for lengths over 55 radii.

Unsupported Length of Columns										Weight of Sect., lbs. per ft.
13 Ft.	14 Ft.	15 Ft.	16 Ft.	17 Ft.	18 Ft.	20 Ft.	22 Ft.	24 Ft.	26 Ft.	
53.5	52.0	50.4	48.9	47.4	45.9	42.8	39.7	36.7		32.0
59.7	58.0	56.3	54.6	53.0	51.3	48.0	44.6	41.3	38.0	34.5
67.7	65.8	64.0	62.1	60.2	58.4	54.6	50.9	47.1	43.4	39.0
75.7	73.6	71.5	69.4	67.4	65.3	61.1	57.0	52.8	48.7	43.5
83.8	81.5	79.2	76.9	74.6	72.4	67.8	63.2	58.7	54.1	48.0
92.1	89.6	87.1	84.6	82.2	79.7	74.7	69.8	64.8	59.9	53.0
100.3	97.7	95.0	92.3	89.6	86.9	81.6	76.2	70.9	65.5	57.5
108.7	105.8	102.9	100.0	97.1	94.2	88.5	82.7	76.9	71.2	62.0
117.3	114.2	111.2	108.1	105.0	101.9	95.8	89.6	83.5	77.3	67.0
125.8	122.5	119.2	116.0	112.7	109.4	102.9	96.3	89.8	83.2	71.5
134.4	131.0	127.5	124.0	120.5	117.0	110.1	103.1	96.2	89.2	76.5
142.	138.9	135.2	131.6	127.9	124.2	116.9	109.6	102.2	94.9	81.0
151.	147.7	143.9	140.0	136.1	132.3	124.6	116.9	109.2	101.5	85.5
160.	156.4	152.4	148.3	144.3	140.2	132.1	124.0	115.9	107.8	90.5

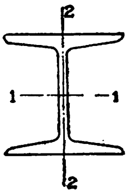
I ls to the right of the heavy line are for lengths greater than 125 radii.

(‑‑y Bethlehem Steel Company Catalogue, 1911 Edition.

GENERAL INFORMATION

STANDARD BEAM COLUMNS

SAFE LOADS IN THOUSANDS OF POUNDS



Lengths 60 radii or under 13000 Lbs. Fibre stress.
Lengths over 60 radii reduced, A. B. Co. Formula.
Weights do not include details.

Eff. Len. in ft.	DEPTH AND WEIGHT OF SECTIONS												
	H BEAMS				STANDARD I-BEAMS								
	8 in. 34.3 lbs.	6 in. 24.1 lbs.	5 in. 18.9 lbs.	4 in. 13.8 lbs.	15 in. 42.9 lbs.	12 in. 31.8 lbs.	10 in. 25.4 lbs.	9 in. 21.8 lbs.	8 in. 18.4 lbs.	7 in. 15.3 lbs.	6 in. 12.5 lbs.	5 in. 10.0 lbs.	4 in. 7.7 lbs.
2	130.0	91.0	71.5	52.0	162.2	120.4	95.8	82.0	69.3	57.5	46.9	37.3	28.7
3	130.0	91.0	71.5	52.0	162.2	120.4	95.8	82.0	69.3	57.5	46.9	37.3	28.5
4	130.0	91.0	71.5	52.0	162.2	120.4	95.8	82.0	69.3	56.8	44.5	33.3	24.0
5	130.0	91.0	71.5	50.7	162.2	120.4	94.4	77.8	63.2	50.0	38.5	28.0	19.5
6	130.0	91.0	71.5	45.7	153.9	109.9	85.3	69.4	55.6	43.2	32.5	22.7	15.2
7	130.0	91.0	66.0	40.6	140.1	98.9	76.2	61.0	48.0	36.4	26.5	18.8	13.0
8	130.0	86.7	60.5	35.6	126.2	87.9	67.1	52.6	40.4	30.3	22.9	16.1	10.8
9	130.0	80.9	55.0	30.5	112.3	76.9	58.0	44.2	35.0	26.9	19.9	13.5	8.5
10	125.8	75.1	49.5	26.7	98.5	65.9	50.2	40.0	31.2	23.5	16.8	10.8	
11	119.4	69.3	44.0	24.2	86.0	59.9	45.7	35.8	27.4	20.1	13.8		
12	113.0	63.5	38.5	21.7	79.0	54.4	41.1	31.5	23.6	16.7	10.8		
13	106.6	57.7	35.8	19.2	72.1	48.9	36.5	27.3	19.8	13.3			
14	100.2	51.9	33.0	16.6	65.2	43.4	32.0	23.1	16.0				
15	93.8	47.6	30.3	14.1	58.2	37.9	27.4	18.9					
16	87.3	44.7	27.5		51.3	32.4	22.9						
17	80.9	41.8	24.8		44.4	26.9							
18	74.5	38.9	22.0		37.4								
19	69.0	36.0	19.3										
20	65.8	33.1	16.5										
Area sq ins	10.01	7.01	5.47	4.00	12.48	9.26	7.37	6.31	5.33	4.42	3.61	2.	21

Safe Load valves above upper zigzag line are for ratios of l/r not over [illegible] [illegible]ose between the zigzag lines are for ratios up to 120 l/r and those below lower z[illegible] line are for ratios not over 200 l/r.

Courtesy Carnegie Steel Company Pocket Companion, 22nd Edition.

GENERAL INFORMATION

STANDARD BEARINGS AND BEARING PLATES

Size of Beams and Channels	Bearing	Bearing Plates		Weight each
		Dimensions	Area	
Inches	Inches	Inches	Sq. Inches	Pounds
3	6	6 x 6 x 3/8	36	3.83
4	6	6 x 6 x 3/8	36	3.83
5	6	6 x 6 x 3/8	36	3.83
6	6	6 x 6 x 3/8	36	3.83
7	8	8 x 8 x 1/2	64	9.
8	8	8 x 8 x 1/2	64	9.
9	8	8 x 8 x 1/2	64	9.
10	12	12 x 12 x 3/4	144	31.
12	12	12 x 12 x 3/4	144	31.
15	12	12 x 15 x 3/4	180	39.
18	15	15 x 15 x 7/8	225	56.
20	15	15 x 18 x 1	270	76.5
24	15	15 x 18 x 1	270	76.5

Courtesy Cambria Steel Company Handbook, 10th Edition.

STRESSES IN MASONRY

The allowable stresses in masonry shall not exceed the following:

	Tons per Sq. foot	Pounds per Sq. inch
Common Brick, Portland Cement Mortar.	12	168
Hard Burned Brick, Portland Cement Mortar.	15	210
F ...ble Masonry, Port. Cement Mortar.	10	140
F ... Class Masonry, Crystalline Sandstone or Limestone.	25	350
F ... Class Masonry, Granite.	30	420
F ...tland Cement Concrete, 1–3–5.	20	280
F ...tland Cement Concrete, 1–2–4.	30	420

...tesy Ketchum's Structural Engineers Handbook, First Edition

GENERAL INFORMATION

LOADS ON FOUNDATIONS

The loads on foundations shall not exceed the following in tons per square foot:

Ordinary clay and dry sand mixed with clay	2
Dry sand and dry clay	3
Hard clay and firm coarse sand	4
Firm coarse sand and gravel	5
Shale rock	8
Hard rock	20

For all soils inferior to the above, such as loam, etc., never more than one ton per square foot.

PRESSURES ON MASONRY

The pressure of column bases, beams, etc., on masonry shall not exceed the following in pounds per square inch:

Brick work with cement mortar	250
Rubble masonry with cement mortar	250
Portland cement concrete, 1-2-4	500
First class dimension sandstone or limestone	400
First class granite	500

Courtesy Ketchums Structural Engineers Handbook, first edition.

GENERAL INFORMATION

WEIGHTS OF PARTITIONS

IN POUNDS PER SQUARE FOOT

	Thickness	Un-Plast.	One Side Plast.	Two Sides Plast.
Terra Cotta—(Semi-porus)....	3″	15.	21.	27.
	4″	16.	22.	28.
	5″	18.	24.	30.
	6″	24.	30.	36.
	8″	30.	36.	42.
Gypsum Block, solid..........	2″	9.25	15.5	21.5
Gypsum Block, solid	3″	12.4	18.5	24.5
Gypsum Block, hollow........	3″	10.	16.	22.
Gypsum Block, hollow........	4″	13.	19.	25.
Gypsum Block, hollow........	5″	15.6	21.5	27.5
Gypsum Block, hollow........	6″	16.6	22.5	28.5
Gypsum Block, hollow........	8″	22.	28.	34.
Metal Lath with solid plaster...	2″			20.
Metal Studs and lath, hollow...	4″ to 6″	2.		22.

WEIGHTS OF WALLS

9″ Brick	84 lbs.	4″ Brick and 4″ Tile Backing	60
13″ Brick	121 lbs.	4″ Brick and 8″ Tile Backing	75
18″ Brick	168 lbs.	9″ Brick and 4″ Tile Backing	102
22″ Brick	205 lbs.	8″ Tile	33
26″ Brick	243 lbs.	12″ Tile	45

16 lbs. per square foot for plastering.

GENERAL INFORMATION

RIVETS

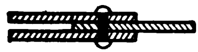
RIVETS FAIL IN ONE OF TWO WAYS

(a) By Rivet Shearing.

(b) By Crippling of Sheet or Plate.

SHEAR AND BEARINGS

Ordinary (or not symmetrical) bearing. Rivets in Single Shear.



Web (or symmetrical) bearing Rivets in Double Shear.

Rivets seldom run over ⅞ inch in diameter, and are rarely used in over 1-inch plates.

STEEL VALUES USED IN BUILDING CONSTRUCTION

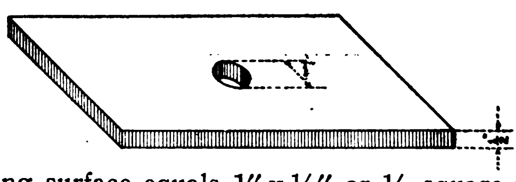
Shearing value of connecting plates equals ¾ of working tensile value of steel.

Shearing value of rivets equals 5/6 of shearing value on plates.

Bearing value, ordinary, equals 1½ times working compressive value of steel.

Bearing value, web, equals 2 times working compressive value of steel.

Bearing value is the bearing surface multiplied by the allowable stress per square inch on that surface. The bearing surface is the diameter of the rivet multiplied by the thickness of the plate, thus:



Bearing surface equals 1″ x ½″ or ½ square i

GENERAL INFORMATION

RIVETS

Holes in sheets for cold rivets or bolts are punched 1/32 inch larger than rivets to be used.

Holes in structural steel for hot rivets, punched $\frac{1}{16}$ inch larger than rivets.

Areas to be deducted to obtain the net area of the plate, are based on the size of the hole.

Rivet area in shear is the net area before the rivet is driven.

In ordinary bearing, the shearing value equals the area times the shearing value.

In web bearing, the shearing value equals twice the area times the shearing value.

SPACING OF RIVETS IN BUILDING CONSTRUCTION

Rivets are not to be spaced closer center to center than 3 times diameter of rivet, nor,

Farther in compression than 16 times thickness of the thinnest outside plate, and,

In no case farther than 6 inches.

Center of rivet from side of plate equals ½ thickness of plate plus ½ diameter of rivet plus ⅛ inch.

Center of rivet from end of plate equals thickness of plate plus ½ diameter of rivet plus ½ inch.

STRESSES USED IN BUILDING CONSTRUCTION

Shearing value of connecting plates equals 12,000 lbs. per re inch.

iearing value of rivets equals 10,000 lbs. per square

:aring value (ordinary or single shear) equals 20,000 per square inch.

:aring value (web or double shear) equals 26,000 lbs. quare inch.

GENERAL INFORMATION

RIVETS

SHEARING VALUE OF RIVETS AND BEARING VALUE OF RIVETED SHEETS AND PLATES

Rivets		Unit Stress 10,000 lbs. per Sq. Inch		Bearing Value for Different Thickness of Plate in Inches, at 20,000 lbs. per Square Inch								
Diam. of Rivet	Area in Sq. in.	Sin. Shear	Dou. Shear	15 Ga. .072"	.089"	.092"	12 Ga. .109"	11 Ga. .120"	7 Ga. 3/16"	1/4"	5/16"	3/8"
1/4"	.0491	491	982	360	445	460	545	600	937	1250		
5/16"	.0767	767	1534	450	556	575	681	750	1172	1563	1953	
3/8"	.1104	1104	2208	540	668	690	817	900	1406	1875	2344	2813
7/16"	.1503	1503	3006	630	779	805	954	1050	1640	2186	2734	3282
1/2"	.1963	1963	3926	720	890	920	1090	1200	1875	2500	3125	3750
5/8"	.3068	3068	6136	900	1112	1150	1362	1500	2343	3125	3906	4688
3/4"	.4418	4418	8836	1080	1335	1380	1635	1800	2812	3750	4688	5625
7/8"	.6013	6013	12026	1260	1558	1610	1907	2100	3281	4375	5469	6563
1"	.7854	7854	15708	1440	1780	1840	2180	2400	3750	5000	6250	7500

NOTE.—The above bearing values are based on plates in single shear. If plates are in double shear, bearing values may be increased to 26,000 lbs. per square inch.

Bearing values of plates between these heav lines are less than corresponding values rivets in single shear. Therefore the beari values on plates govern the design.

GENERAL INFORMATION

RIVETS

SHEARING VALUE OF RIVETS AND BEARING VALUE OF RIVETED SHEETS AND PLATES

Bearing Value for Different Thickness of Plate in Inches, at 20,000 lbs. per Square Inch										
7/16"	1/2"	9/16"	5/8"	11/16"	3/4"	13/16"	7/8"	15/16"	1"	Diam. of Rivet
										1/4"
										5/16"
										3/8"
3828										7/16"
4375	5000	5625								1/2"
5469	6250	7031	7813							5/8"
6563	7500	8438	9375	10313	11250					3/4"
7656	8750	9844	10938	12031	13125	14219	15313	16406	17500	7/8"
8750	10000	11250	12500	13750	15000	16250	17500	18750	20000	1"

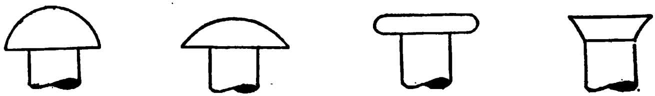
Bearing values of plates between these .avy lines are greater than corresponding ılues of rivets in single shear and less than ouble shear. Therefore single shearing alues of rivets govern the design in case of .vets in single shear, and bearing value on 'ates govern in case of rivets in double shear.

Bearing values of plates to right of heavy line are greater than corresponding values of riyets in double shear. Therefore single shearing values govern the design in case of rivets in single shear, double shearing values govern for rivets in double shear.

GENERAL INFORMATION

SMALL RIVETS

APPROXIMATE NUMBER IN 1 POUND



Round Head — Oval Head — Flat Head — Flat Countersunk Head

Length Inches	DIAMETER ¼	5/16	⅜	7/16	½
½	80	51	32.	19.	
⅝	70	45	29.	18.	
¾	63	41	23.7	14.7	11.
⅞	57	37	21.9	13.7	10.3
1	52	34	20.3	12.8	9.7
1⅛	47	31	19.	12.	9.1
1¼	44	29	17.8	11.3	8.6
1⅜	41	27	16.7	10.6	8.1
1½	40	25	15.8	10.1	7.7
1⅝	38	23	15.0	9.6	7.4
1¾	35	22	14.2	9.1	7.
1⅞	34	20	13.5	8.7	6.7
2	30	19	12.9	8.3	6.4

Measure Countersunk Head Rivets over all.
All other styles are measured from under the head.

Courtesy The Atlas Bolt & Screw Company Catalogue.

RIVETS USED FOR BERLOY METAL LUMBER

.072" sections, 2 thicknesses of metal, ¼" diameter x ½" long.
.072" sections, 3 thicknesses of metal, ¼" diameter x ⅝" long.
Heavier sections, 2 thicknesses of metal, 5/16" diameter x ⅝" long.
Heavier sections, 3 thicknesses of metal, 5/16" diameter x ¾" long.

GENERAL INFORMATION

WEIGHT, LENGTH AND AREA OF STEEL WIRE

Gauge of J. A. Roebling & Sons Co. and The American Steel & Wire Co.

Gauge No.	Diameter in inches	Area in sq. inches	Weight in Pounds per 1000 ft.	Weight in Pounds per mile	No. of feet in 2000 lbs.
000,000	0.460	0.166191	558.4	2948	3582
00,000	0.430	0.145221	487.9	2576	4099
0,000	0.394	0.121304	407.6	2152	4907
000	0.362	0.102922	345.8	1826	5783
00	0.331	0.086049	289.1	1527	6917
0	0.307	0.074023	248.7	1313	8041
1	0.283	0.062902	211.4	1116	9463
2	0.263	0.054325	182.5	964	10957
3	0.244	0.046760	157.1	830	12730
4	0.225	0.039761	133.6	705	14970
5	0.207	0.033654	113.1	597	17687
6	0.192	0.028953	97.3	514	20559
7	0.177	0.024606	82.7	437	24191
8	0.162	0.020612	69.3	366	28878
9	0.148	0.017203	57.8	305	34600
10	0.135	0.014314	48.1	254	41584
11	0.120	0.011310	38.0	201	52631
12	0.105	0.008659	29.1	154	68752
13	0.092	0.006648	22.3	118	89525
14	0.080	0.005027	16.9	89.2	118413
15	0.072	0.004071	13.7	72.2	146198
16	0.063	0.003117	10.5	55.3	191022
17	0.054	0.002290	7.70	40.6	259909
18	0.047	0.001735	5.83	30.8	343112
19	0.041	0.001320	4.44	23.4	450856
20	0.035	0.000962	3.23	17.1	618620

This table was calculated on a basis of 483.84 pounds per cubic t for steel wire. Iron wire is a trifle lighter.

GENERAL INFORMATION

U. S. GOVERNMENT STANDARD GAUGE (U.S.G.)

THICKNESS AND WEIGHTS

(Based on weight of iron at 480 pounds per cubic foot.)

	THICKNESS			WEIGHT	
Gauge Number	Fractions of an inch	Decimals of an inch	In millimeters	In lbs. sq. ft. avoirdupois	Kilos per sq. meter
7	3/16	.1875	4.76	7.5	36.62
8	11/64	.1719	4.37	6.875	33.57
9	5/32	.1563	3.97	6.25	30.52
10	9/64	.1406	3.57	5.625	27.46
11	1/8	.125	3.18	5.	24.41
12	7/64	.1094	2.78	4.375	21.36
13	3/32	.0938	2.38	3.75	18.31
14	5/64	.0781	1.98	3.125	15.26
15	9/128	.0703	1.79	2.813	13.73
16	1/16	.0625	1.59	2.5	12.21
17	9/160	.0563	1.43	2.25	10.99
18	1/20	.05	1.27	2.00	9.765
19	7/160	.0438	1.11	1.75	8.544
20	3/80	.0375	0.953	1.5	7.324
21	11/320	.0344	0.873	1.375	6.713
22	1/32	.0313	0.794	1.25	6.103
23	9/320	.0281	0.714	1.125	5.493
24	1/40	.025	0.635	1.	4.882
25	7/320	.0219	0.556	0.875	4.272
26	3/160	.0188	0.476	0.75	3.662
27	11/640	.0172	0.437	0.688	3.357
28	1/64	.01563	0.397	0.625	3.052
29	9/640	.0406	0.357	0.563	2.746
30	1/80	.0125	0.318	0.5	2.441

GENERAL INFORMATION
BIRMINGHAM OR STUBS GAUGE (B.W.G.)

THICKNESS AND WEIGHTS

(Based on weight of iron at 480 lbs. per cubic foot)

Gauge Number	THICKNESS Decimals of an inch	THICKNESS In millimeters	WEIGHT In lbs. sq. ft. avoirdupois	WEIGHT Kilos per sq. meter
7	.180	4.572	7.20	35.15
8	.165	4.191	6.60	32.24
9	.148	3.579	5.92	28.90
10	.134	3.404	5.36	26.17
11	.120	3.048	4.80	23.47
12	.109	2.769	4.36	21.29
13	.095	2.413	3.80	18.57
14	.083	2.108	3.32	16.21
15	.072	1.829	2.88	14.06
16	.065	1.651	2.60	12.69
17	.058	1.473	2.32	11.33
18	.049	1.245	1.96	9.57
19	.042	1.067	1.68	8.20
20	.035	0.889	1.40	6.84
21	.032	0.813	1.28	6.25
22	.028	0.711	1.12	5.47
23	.025	0.635	1.0	4.88
24	.022	0.559	0.88	4.30
25	.020	0.508	0.80	3.91
26	.018	0.457	0.72	3.52
27	.016	0.406	0.64	3.12
28	.014	0.356	0.56	2.73
29	.013	0.330	0.52	2.54
30	.012	0.305	0.48	2.34

GENERAL INFORMATION

Common Nails and Brads				Clinch Nails		Finishing Nails	
Size	Length inches	Gauge	No. to lb.	Gauge	No. to lb.	Gauge	No. to lb.
2d	1	15	876	14	710	16½	1351
3d	1¼	14	568	13	429	15½	807
4d	1½	12½	316	12	274	15	584
5d	1¾	12½	271	12	235	15	500
6d	2	11½	181	11	157	13	309
7d	2¼	11½	161	11	139	13	238
8d	2½	10¼	106	10	99	12½	189
9d	2¾	10¼	96	10	90	12½	172
10d	3	9	69	9	69	11½	121
12d	3¼	9	63	9	62	11½	113
16d	3½	8	49	8	49	11	90
20d	4	6	31	7	37	10	62
30d	4½	5	24				
40d	5	4	18				
50d	5½	3	14				
60d	6	2	11				

LARGE HEAD BARBED ROOFING NAILS

Size	Gauge	No. to lb.	Size	Gauge	No. to lb.
¾″	13	714	1⅛″	12	3[illegible]
⅞″	12	469	1¼″	11	2[illegible]
1″	12	411			

Courtesy Kidder's, Architects and Builders Pocket Book, 16th Edition.

GENERAL INFORMATION

ROUND AND FLAT HEAD IRON STOVE BOLTS

APPROXIMATE NUMBER IN 1 POUND (INCLUDING NUTS)

Length in Inches	DIAMETER IN INCHES			
	3/16	1/4	5/16	3/8
3/8	113	49	31.	21.
1/2	104	46	29.	20.
5/8	95	43	27.	18.7
3/4	88	40	25.	17.6
7/8	82	38	24.	16.6
1	77	36	23.	15.7
1 1/8	72	34	22.	15.
1 1/4	68	33	21.	14.2
1 3/8	65	31	20.	13.6
1 1/2	61	30	19.	13.
1 3/4	56	28	17.	12.
2	51	26	16.	11.1
2 1/4	47	24	15.	10.3
2 1/2	43	22	14.	9.7
2 3/4	41	21	13.	9.1
3	38	20	12.5	8.6
3 1/4	36	19	12.	8.1
3 1/2	34	18	11.2	7.7
3 3/4	32	17	10.7	7.3
4	30	16	10.2	7.0

Courtesy The Atlas Bolt & Screw Company Catalogue.

GENERAL INFORMATION

MACHINE BOLTS WITH NUTS

APPROXIMATE NUMBER IN 1 POUND

Size in Inches	1/4	5/16	3/8	7/16	1/2
1/2	44.7	22.8	14.4	8.1	6.8
3/4	40.	20.9	13.3	7.6	6.3
1	36.4	19.2	12.4	7.1	5.8
1 1/4	33.3	17.8	11.5	6.7	5.5
1 1/2	30.	16.6	10.8	6.4	5.1
1 3/4	28.4	15.5	10.2	6.1	4.8
2	26.5	14.5	9.6	5.8	4.6
2 1/4	24.8	13.7	9.1	5.5	4.3
2 1/2	23.3	13.0	8.6	5.3	4.1
2 3/4	22.	12.3	8.2	5.1	4.0
3	20.	11.7	7.8	4.8	3.8
3 1/4	19.7	11.2	7.5	4.7	3.6
3 1/2	18.8	10.7	7.2	4.5	3.5
3 3/4	18.	10.2	6.9	4.3	3.3
4	17.1	9.8	6.6	4.2	3.2
4 1/2	15.7	9.1	6.1	3.9	3.0
5	14.5	8.4	5.7	3.7	2.8
5 1/2	13.5	7.9	5.3	3.5	2.6
6	12.7	7.4	5.	3.3	2.4

Courtesy The Atlas Bolt & Screw Company Catalogue.

GENERAL INFORMATION

STANDARD STEEL WASHERS

U. S. STANDARD SIZES

Diameter in Inches	Size of Hole	Thickness Wire Gauge	Size of Bolt in Inches	Est. Number in One Pound
9/16	1/4	18	3/16	440.
3/4	5/16	16	1/4	156.
7/8	3/8	16	5/16	112.
1	7/16	14	3/8	68.
1 1/4	1/2	14	7/16	43.
1 3/8	9/16	12	1/2	26.
1 1/2	5/8	12	9/16	22.5
1 3/4	11/16	10	5/8	13.
2	13/16	10	3/4	10.1
2 1/4	15/16	9	7/8	8.5
2 1/2	1 1/16	9	1	6.1
2 3/4	1 1/4	9	1 1/8	5.1
3	1 3/8	9	1 1/4	4.
3 1/4	1 1/2	8	1 3/8	3.2
3 1/2	1 5/8	8	1 1/2	2.8
3 3/4	1 3/4	8	1 5/8	2.4
4	1 7/8	8	1 3/4	2.2
4 1/4	2	8	1 7/8	2.
4 1/2	2 1/8	8	2	1.8
4 3/4	2 3/8	8	2 1/4	1.4
5	2 5/8	7	2 1/2	1.1

Courtesy The Atlas Bolt & Screw Company Catalogue.

GENERAL INFORMATION

STANDARD DIFFERENTIALS AND EXTRAS

ONE PASS COLD ROLLED BLACK SHEETS

Gauge	Price Per Hundred Pounds
30 Add	20c
29 Add	10c
28 (Carload quantities)	Base
27 Deduct	5c
25–26 Deduct	10c
22–24 Deduct	15c
17–21 Deduct	20c
15–16 Deduct	25c
13–14 Deduct	30c
10–12 Deduct	35c

BLUE ANNEALED SHEETS

Gauge	Price Per Hundred Pounds
8 and Heavier	Less 5c
9 and 10 (Carload quantities)	Base
11 and 12	Add 5c
13 and 14	Add 10c
15 and 16	Add 20c

GALVANIZED SHEETS AND LONG TERNE SHEETS

Gauge	Price Per Hundred Pounds
30 Add	50c
29 Add	25c
28 (Carload quantities)	[illegible]
27 Deduct	[illegible]
25–26 Deduct	[illegible]
22–24 Deduct	[illegible]
17–21 Deduct	[illegible]
15–16 Deduct	[illegible]
12–14 Deduct	[illegible]
10–11 Deduct	[illegible]

GENERAL INFORMATION

TABLE FOR COMPUTING LENGTHS OF CURVED SHEETS

TO ASCERTAIN LENGTH OF A CURVED SHEET BY FOLLOWING TABLE:

Rule. Divide height by base, find quotient in column of heights, take length for that height opposite to it in next column on the right hand. Multiply length thus obtained by base and product will give length of sheet.

Example. To find length of sheet, base (or span) being 100 inches, rise being 25 inches.

25 divided by 100 equals .25; and .25 per table, equals 1.15912, length of base, which multiplied by 100 equals 115.912, which is length of sheet.

If for ceiling, give exact distance between sets of iron beams, rise of sheet, and length and number of sections. If for roofing, give number and length of sheets and radius required.

Height	Length	Height	Length	Height	Length	Height	Length
.001	1.00002	.110	1.03196	.140	1.05147	.170	1.07537
.005	1.00007	.111	1.03254	.141	1.0522	.171	1.07624
.01	1.00027	.112	1.03312	.142	1.05293	.172	1.07711
.015	1.00061	.113	1.03371	.143	1.05367	.173	1.07799
.02	1.00107	.114	1.0343	.144	1.05441	.174	1.07888
.025	1.00167	.115	1.0399	.145	1.05516	.175	1.07977
.03	1.0024	.116	1.03551	.146	1.05591	.176	1.08066
.035	1.00327	.117	1.03611	.147	1.05667	.177	1.08156
.04	1.00426	.118	1.03672	.148	1.05743	.178	1.08246
.045	1.00539	.119	1.03734	.149	1.05819	.179	1.08337
.05	1.00665	.120	1.03797	.150	1.05896	.180	1.08428
.055	1.00805	.121	1.0386	.151	1.05973	.181	1.08519
.06	1.00957	.122	1.03923	.152	1.06051	.182	1.08611
.065	1.01123	.123	1.03987	.153	1.0613	.183	1.08704
.07	1.01302	.124	1.04051	.154	1.06209	.184	1.08797
.075	1.01493	.125	1.04116	.155	1.06288	.185	1.0889
.08	1.01698	.126	1.04181	.156	1.06368	.186	1.08984
.085	1.01916	.127	1.04247	.157	1.06449	.187	1.09079
.09	1.02146	.128	1.04313	.158	1.0653	.188	1.09174
.095	1.02389	.129	1.0438	.159	1.06611	.189	1.09269
1	1.02645	.130	1.04447	.160	1.06693	.190	1.09365
1	1.02698	.131	1.04515	.161	1.06775	.191	1.09461
2	1.02752	.132	1.04584	.162	1.06858	.192	1.09557
3	1.02806	.133	1.04652	.163	1.06941	.193	1.09654
4	1.0286	.134	1.04722	.164	1.07025	.194	1.09752
5	1.02914	.135	1.04792	.165	1.07109	.195	1.0985
06	1.0297	.136	1.04862	.166	1.07194	.196	1.09949
07	1.03026	.137	1.04932	.167	1.07279	.197	1.10048
8	1.03082	.138	1.05003	.168	1.07365	.198	1.10147
9	1.03139	.139	1.05075	.169	1.07451	.199	1.10247

GENERAL INFORMATION

TABLE FOR COMPUTING LENGTHS OF CURVED SHEETS—Continued

Height	Length	Height	Length	Height	Length	Height	Length
.200	1.10348	.236	1.14247	.272	1.18688	.308	1.23636
.201	1.10447	.237	1.14363	.273	1.18819	.309	1.2378
.202	1.10548	.238	1.1448	.274	1.18969	.310	1.23925
.203	1.1065	.239	1.14597	.275	1.19082	.311	1.2407
.204	1.10752	.240	1.14714	.276	1.19214	.312	1.24216
.205	1.10855	.241	1.14831	.277	1.19345	.313	1.2436
.206	1.10958	.242	1.14949	.278	1.19477	.314	1.24506
.207	1.11062	.243	1.15067	.279	1.1961	.315	1.24654
.208	1.11165	.244	1.15186	.280	1.19743	.316	1.24801
.209	1.11269	.245	1.15308	.281	1.19887	.317	1.24946
.210	1.11374	.246	1.15429	.282	1.20011	.318	1.25095
.211	1.11479	.247	1.15549	.283	1.20146	.319	1.25243
.212	1.11584	.248	1.1567	.284	1.20282	.320	1.25391
.213	1.11692	.249	1.15791	.285	1.20419	.321	1.25539
.214	1.11796	.250	1.15912	.286	1.20558	.322	1.25686
.215	1.11904	.251	1.16033	.287	1.20696	.323	1.25836
.216	1.12011	.252	1.16157	.288	1.20828	.324	1.25987
.217	1.12118	.253	1.16279	.289	1.20967	.325	1.26137
.218	1.12225	.254	1.16402	.290	1.21202	.326	1.26286
.219	1.12334	.255	1.16526	.291	1.21239	.327	1.26437
.220	1.12445	.256	1.16649	.292	1.21381	.328	1.26588
.221	1.12556	.257	1.16774	.293	1.2152	.329	1.2674
.222	1.12663	.258	1.16899	.294	1.21658	.330	1.26892
.223	1.12774	.259	1.17024	.295	1.21794	.331	1.27044
.224	1.12885	.260	1.1715	.296	1.21926	.332	1.27196
.225	1.12997	.261	1.17275	.297	1.22061	.333	1.27349
.226	1.13108	.262	1.17401	.298	1.22203	.334	1.27502
.227	1.13219	.263	1.17527	.299	1.22347	.335	1.27656
.228	1.13334	.264	1.17655	.300	1.22495	.336	1.2781
.229	1.13441	.265	1.17784	.301	1.22635	.337	1.27[illegible]
							1.28[illegible]
.230	1.13557	.266	1.17912	.302	1.22776	.338	
.231	1.13671	.267	1.1804	.303	1.22918	.339	1.28[illegible]
.232	1.13786	.268	1.18162	.304	1.23061	.340	1.28[illegible]
.233	1.13903	.269	1.18294	.305	1.23205	.341	1.28[illegible]
.234	1.1402	.270	1.18428	.306	1.23349	.342	1.28[illegible]
.235	1.14136	.271	1.18557	.307	1.23494	.343	1.28[illegible]

GENERAL INFORMATION

TABLE FOR COMPUTING LENGTHS OF CURVED SHEETS—Continued

Height	Length	Height	Length	Height	Length	Height	Length
.344	1.29052	.384	1.35575	.424	1.42583	.464	1.50033
.345	1.29209	.385	1.35744	.425	1.42764	.465	1.50224
.346	1.29366	.386	1.35914	.426	1.42945	.466	1.50416
.347	1.29523	.387	1.36084	.427	1.43127	.467	1.50608
.348	1.29681	.388	1.36254	.428	1.43309	.468	1.508
.349	1.29839	.389	1.36425	.429	1.43491	.469	1.50992
.350	1.29997	.390	1.36596	.430	1.43673	.470	1.51182
.351	1.30156	.391	1.36767	.431	1.43856	.471	1.51378
.352	1.30315	.392	1.36939	.432	1.44039	.472	1.51571
.353	1.30474	.393	1.37111	.433	1.44222	.473	1.51764
.354	1.30634	.394	1.37283	.434	1.44405	.474	1.51958
.355	1.30794	.395	1.37455	.435	1.44589	.475	1.52152
.356	1.30954	.396	1.37628	.436	1.44773	.476	1.52346
.357	1.31115	.397	1.37801	.437	1.44957	.477	1.52541
.358	1.31276	.398	1.37974	.438	1.45142	.478	1.52736
.359	1.31437	.399	1.38148	.439	1.45327	.479	1.52931
.360	1.31599	.400	1.38322	.440	1.45512	.480	1.53126
.361	1.31761	.401	1.38496	.441	1.45697	.481	1.53322
.362	1.31923	.402	1.38671	.442	1.45883	.482	1.53518
.363	1.32086	.403	1.38846	.443	1.46069	.483	1.53714
.364	1.32249	.404	1.39021	.444	1.46255	.484	1.5391
.365	1.32413	.405	1.39196	.445	1.46441	.485	1.54186
.366	1.32577	.406	1.39372	.446	1.46628	.486	1.54302
.367	1.32741	.407	1.39548	.447	1.46815	.487	1.54499
.368	1.32905	.408	1.39724	.448	1.47002	.488	1.54696
.369	1.33069	.409	1.399	.449	1.47189	.489	1.54893
.370	1.33234	.410	1.40077	.450	1.47377	.490	1.5509
.371	1.33399	.411	1.40254	.451	1.47565	.491	1.55228
.372	1.33564	.412	1.40432	.452	1.47753	.492	1.55486
.373	1.3373	.413	1.4061	.453	1.47942	.493	1.55685
.374	1.33896	.414	1.40788	.454	1.48131	.494	1.55854
.375	1.34063	.415	1.40966	.455	1.4832	.495	1.56083
[illegible]	1.34229	.416	1.41145	.456	1.48509	.496	1.56282
[illegible]	1.34396	.417	1.41324	.457	1.48699	.497	1.56481
78	1.34563	.418	1.41503	.458	1.48889	.498	1.5668
79	1.34731	.419	1.41682	.459	1.49079	.499	1.56879
80	1.34899	.420	1.41861	.460	1.49269	.500	1.57079
81	1.35068	.421	1.42041	.461	1.4946		
82	1.35237	.422	1.42222	.462	1.49651		
83	1.35406	.423	1.42402	.463	1.49842		

GENERAL INFORMATION

MELTING POINTS OF METALS IN FAHRENHEIT

Alloy, 3 Lead, 2 Tin, 5 Bismuth	200
Alloy, 1 Tin, 1 Lead	370–460
Aluminum	1160
Aluminum Bronze	1700
Antimony	950
Bismuth	510
Brass	1870
Bronze	1690
Chromium	2939
Copper	2000
Gold	2020
Iron, Cast, white	2075
Iron, Cast, gray	2264
Iron, Wrought	3000–3500
Lead, about	610
Magnesium	1200
Mercury	–39
Nickel	2646
Platinum	3500
Steel	2370–2550
Silver, about	1860
Tin	445
Tungsten	6152
Zinc, about	700
Vanadium, about	3128

COMPARISON OF THERMOMETERS

Freezing Point = 32° Fahrenheit.

Freezing Point = 0° Centigrade.

Boiling Point = 212° Fahrenheit.

Boiling Point = 100° Centigrade.

To ascertain Fahrenheit temperature, Centigrade being given,
Centigrade × 9/5 + 32° = Fahr.

To ascertain Centigrade temperature, Fahrenheit being given,
Fahrenheit — 32° × 5/9 = Cent.

Courtesy E. W. Bliss Company Reference Book.

BEAM AND JOIST DESIGN

By Chief Engineer, Building Materials Division
Mem. Am. Soc. C. E.

PART 1

General Description of Beams and Joists

This part of the article has been written in simple form, and is intended to be more descriptive than technical. It also includes a general outline of the basic principles involved, and the nature of the materials entering into beam and joist design and construction.

PART 2

Reinforced Concrete Beam Design

This part of the article deals with a method of designing Concrete beams and joists in a simplified manner, based upon the use of the fundamental beam formula.

The principles explained in the first part should be understood before reading the latter half of the article.

PART I

GENERAL DESCRIPTION OF BEAMS AND JOISTS

PRINCIPLES INVOLVED

1 General Principles Involved—2 External Forces—3 Internal Stresses—4 Action of Stresses—5 Neutral Axis—6 Flanges and Webs of Beams—7 Stresses in Rubber—8 Yield Point or Elastic Limit—9 Forces Producing Motion—10 Stable Equilibrium—11 Live Loads—12 Dead Loads—13 Factor of Safety—14 Action of Forces—15 Moments of Forces—16 Resisting Moments—17 Balanced Forces—18 Notation of Forces—19 Laws of Forces—20 Relation of External Forces and Internal Stresses.

STRUCTURAL DESIGN

21 Reactions—22 Simple Beams—23 Cantilever Beams—24 Continuous Beams—25 Restrained Beams—26 Shear Defined—27 Vertical Shear—28 Horizontal Shear—29 Concentrated or Distributed Loading—30 Shearing in Various Types of Beams—31 Examples—32 Bending Moments Defined—33 Bending Moment Problems—34 Resisting Inches—35 Limitations in Design.

REINFORCED CONCRETE BEAMS

36 Types of Structures—37 Reinforced Concrete- 8 Outline of Reinforced Concrete Beam Design—39 T it Beam Constants and Coefficients—40 Ratio of Steel). —41 Economical Design.

PART I

GENERAL DESCRIPTION OF BEAMS AND JOISTS

THE PRINCIPLES INVOLVED

The general principles involved in determining the strength of beams and joists are merely those covered by the laws governing lever arms, therefore there are no secrets nor are there any complicated calculations required in the computation of beam values.

Joists are really nothing but small beams, they being so named because they are used in a type of construction requiring close spacing, and carrying proportionately smaller loads. Therefore the description herein given of the principles of beam design applies equally as well to joists.

1. General Principles Involved

The load or loads placed on a beam constitute external forces which tend to bend or break the beam. This tendency is resisted by internal stresses in the beam itself. Therefore if we can apply the simple principles governing the calculation of these external forces and internal stresses we will have no trouble whatever in understanding any kind of beam design.

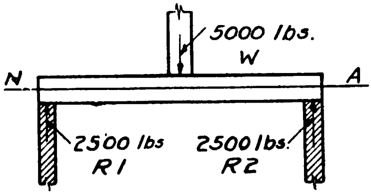


Figure No. 1

A simple type of beam is shown in Fig. No. 1. Let us assume that it is supported by two walls, one under each end of the beam, and that a column carrying a 5000 lb. load is carried by the beam at its center.

2. xternal Forces.

he external forces consist of the 5000 lb. weight pushing down ir he center, and the 2500 lb. reaction in each wall. The down- w rd load in the center amounts to whatever may be applied b the designer or builder, but the upward or supporting forces (lled Reactions) must total at least an amount to equal or s t the downward load or loads.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

A properly designed or selected beam will carry this 5000 lb. load without apparent bending and without breaking down, therefore we must conclude that there are resisting stresses in the beam itself to perform this task.

3. Internal Stresses

The internal stresses which accomplish this result consist of the power of resistance of the material in the beam against crushing, and against pulling apart. An effort on your part to either crush or pull apart a piece of wood or steel will show that it requires great force to do either.

Tests have been made, and the values of all structural materials to resist various stresses are established facts, therefore all beams of the same kind and size always have the same resisting value and tables have been prepared tabulating the strength of standard sizes of beams.

4. Action of Stresses

That the bending or breaking of a beam involves the shortening of the fibres in the top of the beam and the elongation of the fibres in the bottom of the beam can easily be shown by cutting two pieces of paper or cardboard as shown in Fig. No. 2 and pushing a pin through as indicated. Assume this the side of a beam with the top and bottom in a straight line, then measure the distances A and B, which distances will be found to be equal.

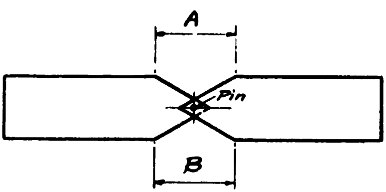


Figure No. 2

And then again measure the distances A and B after brea the straight line of the beam as shown in Fig. No. 3; it wi seen that the distance A has become shorter and the distan has become longer.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

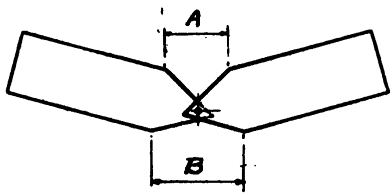


Figure No. 3

5. Neutral Axis

The result in a regular beam is similar; the function of the pin or pivot is replaced by a very thin layer of the material where the change occurs between the action of the top compression stresses and the bottom tension stresses, and the location of this thin layer in the beam is known as the neutral axis, and is shown in Fig. No. 1 in conventional form by a light line lettered N and A at the ends.

In structural engineering the term neutral axis is known as the plane in the center of gravity of the section, which plane in a beam is parallel to the upper and lower surface, and is where there are neither compression nor tension stresses. The neutral axis is not necessarily in the center of the section or beam as will be explained later.

In the case of beams we, of course, do not have actual openings at the top and bottom of the material as in the model shown in Figs. Nos. 2 and 3, but we have in place of them the continuous fibrous material forming the beam.

Therefore we can be sure that beam structures, whether of wood, steel or concrete will under simple load carrying conditions compress in the top flange and stretch in the bottom flange.

Compression is usually represented thus ⟶▭⟵ or ⟶ ⟵ and tension ⟵▭⟶ or ⟵ ⟶.

6. Flanges and Webs of Beams

ıe term flange in this connection refers to the top and b .om portions of a beam. The vertical part of the beam which c nects the top and bottom flanges is termed the web of the b m. The functions of the web in resisting shear will be des bed in a later chapter.

ıe internal resistance exerted in the beam flanges against the t ncy of the material to compress in the top flange and

GENERAL DESCRIPTION OF BEAMS AND JOISTS

stretch in the bottom flange is known as the stress in the beam, and these stresses are termed the compressive and tensile stresses of the beam.

7. Stresses in Rubber

If we step on a small block of soft rubber or pull on the two ends of a rubber band, we will be exerting forces which develop the above described internal resisting compressive and tensile stresses in the rubber. It will easily be seen that the rubber has been compressed under the pressure of the foot and the band has been elongated by the pulling, and further that upon removing the force, the rubber immediately resumes its former shape and dimensions.

8. Yield Point or Elastic Limit

It is possible, however, to compress or stretch materials until the fabric has been deformed or strained to such an extent that it will not return upon removal or release of the load or force to its original shape or dimensions. It is an established fact that an ordinary structural steel bar in direct tension will stretch before losing its power of reaction or resuming its former length upon removal of the load and that it will stretch or elongate about 20% of its original length, before finally pulling apart or breaking.

The point where this strain or permanent deformation starts is called the yield point or elastic limit, hence the reference to materials stressed below the elastic limit or stressed beyond the elastic limit. In the case of the stress below the elastic limit, the force exerted or the work done to compress or stretch the body is stored up in the body in the form of elastic energy, which is again given up in the restoration of the body to its original shape and dimensions. In the case of permanent set or deformation from stress exceeding the elastic limit some of the work is converted into heat as the permanent deformation takes place. As heat is another form of energy it naturally cannot be returned in the form of elastic or mechanical energy and restore the material to its original shape and condition. We are, however, at the present time not interested further in the question of permanent deformation.

The fact that there is a slight deflection or sagging o. beam between supports, which results in some deformatio portions of the beam, even under light loading, must be ke mind as it is an important factor, it being the basis use determining the location of the neutral axis, which will be described.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

In order to consider in greater detail the action of external forces and internal stresses in connection with beams, let us review general conditions and in a simple manner the action of laws relating to levers.

First, upon the basis of external forces acting on a beam.

Second, upon the basis of the action of internal stresses or powers of resistance within a beam.

9. Forces Producing Motion

Force exerted by steam in machinery results in greater intensity or amount, than the resistance of the work to be done, otherwise the machinery would be at a standstill. We can therefore readily see that in such cases unbalanced forces produce action.

10. Stable Equilibrium

In building construction, however, we are not interested in producing motion, but are merely interested in producing a condition wherein the resistance of the members of the structure and the foundation under the structure will successfully resist or support the weight of the entire structure and all applied loads or weights to produce stability, or a condition of stable equilibrium.

11. Live Loads

We must therefore provide in design for, first, the weight of the structure itself; and second, an assumed live load to suit the nature of the use of the building; this live load includes the furniture, shelving, stocks of goods, horses in stable or automobiles in a garage, as well as the weight of the people who may be in or who may congregate in the building.

The vibration of machinery or that caused by marching or dancing is cared for by increasing the assumed live load to meet such special conditions.

Building Codes or the usual rules followed in good practice regulate in terms of assumed pounds per square foot the basis upon which the building is to be designed.

These loads are calculated as, and assumed to act as forces ı downward direction. Sometimes the force of the wind act- on the side of a high building must be taken into account, this is not considered in the simple beam design discussed this chapter.

'o resist the downward loads or forces we must design a ıcture (of which the beams are an important part) of suffi- ıt strength and resistance to produce the condition of stable ilibrium referred to in the previous paragraph.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

12. Dead Loads

In the calculations we take the full total sum of the dead load (the weight of the structure itself including all permanent parts of the construction), plus the assumed live load, and consider this total weight in terms of forces acting downward. Also for the purpose of calculation we figure an equal resistance to these forces as being exerted in the members of the structure upward to support and resist the downward acting forces. Tables of established values of the carrying capacity of walls and columns will be found in hand books on engineering and building construction.

In this discussion of simple beams in many cases where reference is made to concentrated loadings, such as where columns or the ends of a loaded beam are carried by a beam or girder, the weight of the beam carrying these concentrated loads has not been noted. In actual practice the weight of the beam itself should always be considered. The method of combining the results of concentrated and uniform or distributed loads is described in the details of calculating loads, moments, etc.

13. Factor of Safety

Economy dictates that we shall supply structural members which will just nicely care for the loads involved.

In order, however, to provide for possible defective material or workmanship and for safety in case of overloading, the established working values of all materials of construction are discounted and these so-called Safe Working Values are used for the calculation of the strength of the entire supporting structure. This discounting of average material values is referred to as the Factor of Safety which always governs in good design.

14. Action of Forces

Forces may act in any direction, such as to rotate about a pivot or fulcrum, or they may act in parallel directions, as for instance in a beam, when they act in compression in the top flange and in tension in the bottom flange.

Where two like forces act parallel to each other, but in op site directions, they are said to form a couple. This is the c in a beam where compressive stresses act in the upper part a tensile stresses act in the lower part of the beam, and they parallel to each other and opposite in direction.

The same term "a couple" is applied to the downward for acting as loads on a beam and the upward resisting forces

GENERAL DESCRIPTION OF BEAMS AND JOISTS

porting the beam, these also being parallel to each other and opposite in direction.

In the case of rotating forces acting about a pivot the calculation of moments of forces is made about the pivot, but in the case of beams, involving internal stresses, the forces act about each other and calculations of moments are based upon the depth of the beam.

In order to make calculations involving external forces and internal stresses we must reduce both into some unit value, in which terms we can compare their resultant values in the same way in which we compare the weight of various materials in ounces, pounds or tons. Therefore we resolve the resultant actions of force into terms of moments of force and stresses into resisting moments.

15. Moments of Forces

The moment of a force about any point is the product of the intensity of the force by the perpendicular distance between the line of action of the force and the point about which the moment is taken, or the moment of force about a point is the measure of the tendency of the force to turn the body to which the force is applied about that point. There is no tendency to a turning movement in case 3, Fig. 6, the force is parallel to the point; but in the other cases the force is perpendicular to the point, therefore there are moments of forces as described.

In building construction the intensity of the force is the power exerted by the action of one body upon another, or the weight or earth-pull of an object supported, or the amount of resistance against movement.

The perpendicular distance referred to is the distance at right angles to the direction of the movement of the direction of the force, and is known as the leverage of the force.

In the figures given below the moments of force about the points A, B, C, D, F1, and F2 are as follows:

1st Case,

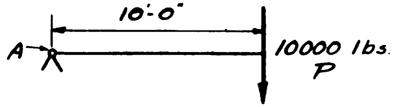


Figure No. 4

The moments of force P about point A is 10,000 (lbs.) x 10′ (leverage) or 100,000 foot pounds.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

2nd Case,

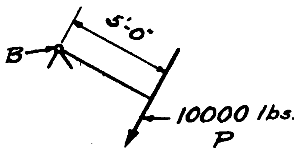


Figure No. 5

The moment of force P about point "B" is 10,000 (lbs.) x 5' (leverage) or 50,000 foot pounds.

3rd Case,

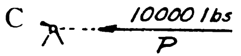


Figure No. 6

The moment of force P about point "C" is 10,000 (lbs.) x 0' (leverage) or Zero, there being no leverage.

4th Case.

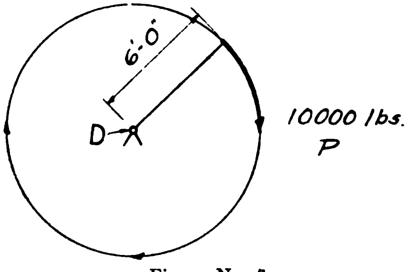


Figure No. 7

The moment of force P about point D is 10,000 (lbs.) x 6' (leverage) or 60,000 foot pounds and is the same at any point on the perimeter of the circle.

16. Resisting Moments

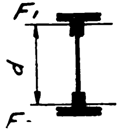


Figure No. 8

GENERAL DESCRIPTION OF BEAMS AND JOISTS

In a plate girder the resisting moment is the steel value in either flange multiplied by the distance between the center of gravity of the flanges.

Therefore the resisting moment is the value of the steel in the flanges (representing forces) multiplied by the distance "d" (representing the leverage of the forces). It should be noted that depth is an important factor, as with any fixed flange area or value the strength of the girder increases rapidly with increased depth.

The values of steel in pounds and the areas of the flanges are based on square inches. If "d" is in terms of inches, the result will be in terms of inch pounds. If "d" is taken in terms of feet, the result will be in terms of foot pounds.

In steel or wood beams and joists the resisting moment is based upon the sectional areas and the extreme fibre stress of the material in question, the extreme fibre stress being the horizontal unit stress, either tensile or compressive upon the fibre most remote from the neutral axis, this stress is also frequently referred to as the modulus of rupture or value of S.

While these values are sometimes given as maximum values, the safe working values (see section 13) are those used in the determination of the resisting moments of sections.

The method of calculating the elements (including the inertia and section modulus) of a Berloy Metal Lumber pressed steel I joist is given on page 35 of this hand book.

Illustrations are given of the detail methods employed in the calculations of the strength of structural steel sections in the Pocket Companion (or hand book) published by the Carnegie Steel Co., 22nd edition, pages 143 and 148. There are also included tables which tabulate the elements and load carrying capacities of standard structural steel shapes.

Similar tables relating to wood beams and joists, also trussed beams are given in the Southern Pine Manual published by the S thern Pine Association of New Orleans, La.

reinforced concrete beams the steel reinforcement is calcula at its safe working value with the lever arm based on the c ter of area of the steel, and the concrete upon its extreme fi e stress value and the lever arm based upon the center of a on of the concrete.

he reinforcing steel always acts as the tensile member and s mes to assist in the compressive member. Concrete is

GENERAL DESCRIPTION OF BEAMS AND JOISTS

calculated as resisting compression stresses but is not considered as resisting tension stresses. Details of design are given in this book in the chapter on the design of reinforced concrete beams.

17. Balanced Forces

Where forces or loads are balanced it will be found that the moments of force are equal.

This fact can be easily proven by nailing a yard stick up on a support, the nail being driven in the center of the stick (the nail hole should be larger than the nail so that the stick will be free to revolve about the nail), then hang a one pound weight on each end, and the stick will remain in a horizontal (or balanced) position and the moment at either end will be 1 lb. x 18 inches or 18 inch pounds. Now hang on one end the 1 lb. weight and nine inches in from the other end a 2 lb. weight, the stick will again be in balance with the moments as follows: on one side 1 lb. x 18 inches or 18 inch pounds and on the other side 2 lbs. x 9 inches also totaling 18 inch pounds.

This proves that the principle is true and it is equally true in any case, and with any system of loading involving any number of loads, wherein the moments on either side of the support or pivot are equal.

Therefore we can apply at one end of the yard stick a 2 lb. weight, and on the other side a 1 lb. weight at the end, and a 2 lb. weight nine inches in from the end, the moments in the case being.

on one arm	2 lbs. x 18 in. or		36 inch lbs.
and on the other arm	1 lb. x 18 in. or	18 inch lbs.	
plus	2 lbs. x 9 in. or	18 inch lbs.	
	Total		36 inch lbs.

The definition of the unit moment such as foot pounds or inch pounds, or possibly foot tons is based on the units of length and weight being used.

18. Notation of Forces

If the forces rotate we can readily describe the directio... f rotation by noting them as moving in a clockwise direction n the direction of the movement of the hands of a clock, d generally considered as positive and given the plus + sign r counter-clockwise (in a direction opposite to the directio f movement of the hands of a clock, and generally conside- s

GENERAL DESCRIPTION OF BEAMS AND JOISTS

negative and given the minus — sign). The signs however may be reversed in order if so desired, but the directions used should be consistently followed. Rotations are supposed to be viewed from the readers side of the printed page.

Forces assumed as acting upward are usually given the plus sign, and those downward the minus sign.

The force of stresses tending to produce compression are also usually given the plus sign, and those tending to produce tension the minus sign.

19. Laws of Forces

From the foregoing description and illustrations we should be readily able to understand and apply the following established laws relating to forces. ("B" and "C" are repeated so as to complete the group.)

"A" A force is known when its *intensity, place of application* and *direction* are known, see Sec. 15.

In other words:

(1) We must know its power or intensity.
(2) We must know its leverage of action.
(3) We must know its direction of action.
(4) Force can only be transferred on its line of action.

"B" The moment of a force about any point is the product of the intensity of the force by the perpendicular distance between the line of action of the force and the point about which the moment is taken. See Sec. 15.

"C" The perpendicular distance referred to is called the leverage of the force. See Sec. 15.

"D" Moments which tend to produce rotation or movement in the one (or the same) direction are of like kind and are to be added.

Moments which tend to produce rotation or movement in an opposite direction are of unlike kind and are to be subtracted. S Sec. 18.

Hence the total movement of a system of forces about a certain point is the algebraic sum of the moments of each force about that point. See Sec. 17.

"E" If the algebraic sum of the moments of the forces acting about a point is zero, there is no actual moment at that point, therefore no tendency of the system to rotate or move about that point.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

Hence we have the law. If a system of forces acting on a body is in equilibrium the body is in equilibrium. And therefore the algebraic sum of the moments of the forces is zero about any of the body. See Sec. 17.

20. Relation of External Forces and Internal Stresses

The carrying power of a beam consists of its resistance to bending or breaking, this resistance in the top of the beam is the strength of the material exerted against the tendency to compress, shorten or crush, and in the bottom of the beam the strength of the material is exerted against the tendency to stretch, lengthen or pull apart. See Sec. 3.

The strength of materials to resist these two tendencies has been investigated and standard values have been established. See Sec. 3.

As noted in Sec. 14, moments of external forces tending to rotate about a pivot or point are calculated as acting about that pivot or point of support, and moments of internal stresses or forces in beams are calculated as acting about each other.

Therefore we can illustrate the external forces acting on and the internal stresses acting in beams in Fig. No. 9.

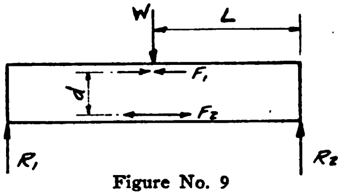


Figure No. 9

Assuming again a simple beam with a single concentrated load in the center as shown in Fig. No. 1.

In computing the external moment of force (termed the bending moment) acting on the beam, let us picture in our m--s the load W as the point "A" in Fig. No. 4, and the force F r R_2 (termed reactions) as the force P tending to rotate about r. Then the bending moment which the beam must resist equals e force R_1 or R_2 multiplied by the distance L. (This dist e should be taken in inches and R_1 or R_2 in pounds so that e bending moment will be in inch pounds.)

As we are merely aiming to produce a condition of s e equilibrium (See Sec. 10) we use as a basis of calculati- e

GENERAL DESCRIPTION OF BEAMS AND JOISTS

load W and assume the reaction R_1 plus R_2 as equal to and carrying that load.

In computing the moments of force (termed stresses) acting within the beam, and known as the resisting moment, let us assume that stresses F_1 and F_2 are the flanges of the beam shown with the same letters in Fig. No. 8. Then the resisting moment of the beam is either the stress F_1 multiplied by the distance d or the stress F_2 multiplied by the distance d.

In properly designed beams the resisting moment must at least equal the bending moment.

This clearly shows that the bending moment (or the unit indicating the result of the load on the beam), and the resisting moment (a similar unit indicating the carrying capacity of the beam) are the results of simple calculations based upon the leverage of forces or stresses, and the principles involved are covered by the laws covering lever arms. See Sec. 1.

It will now be in order to discuss the detail methods employed in the calculation of resisting and bending moments.

STRUCTURAL DESIGN

21. Reactions.

In resolving the loads on beams into unit values or bending moments it will first be necessary to determine the reactions or the resulting loads on columns or walls from the beams. And second to consider the question of shear.

In simple cases, with one support at each end of the beam, with loads at or equally distributed about the center, such as uniformly distributed loads, one concentrated load in the center, or two or more like loads uniformly distributed about the center, the reaction on each support is the same, i. e.: ½ of the total load.

These are shown graphically as follows:

Case I.

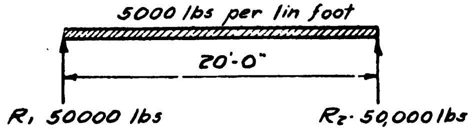
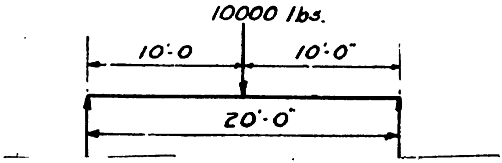


Figure No. 10A

Uniformly Distributed Load

GENERAL DESCRIPTION OF BEAMS AND JOISTS

Case II.



R₁ = 5,000 lbs. R₂ = 5,000 lbs.

Figure No. 10B

Concentrated Load in Center

Case III.

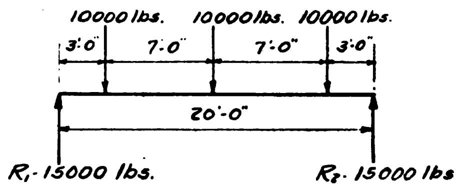


Figure No. 10C

Case IV.

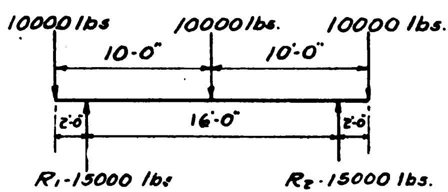


Figure No. 10D

Reactions are usually given the notation R, and numbered left to right as shown above.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

It is evident from these that (as stated in Sec. 12), the reaction values must equal the downward loads. It is also true that the reactions must equal the downward loads in the following examples where the loads are not equally distributed about the center, but the reactions will not be the same at each support. The reactions in such cases are determined by calculating the moments of force, and this procedure will determine the reactions with any number or any system of loads.

In finding the reactions it is generally easiest to take moments about one of them, as you will then have the known moments of the applied loads, and the unknown reactions only to deal with as a simple equation. As this is merely carrying out the general principles already described, three or four examples should clearly show their application to the question at issue.

Case V.

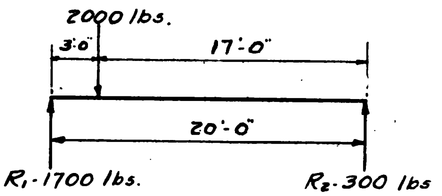


Figure No. 11

Taking moments about R_1.

(Load) 2,000 lbs. x (leverage) 3′ 0″ = 6000 lbs.

And R_2 equals the moment of force or 6000 lbs.
ided by the distance from R_1 or 20′ = 300 lbs.

R the two reactions must equal the load
2000 lbs. — 300 lbs. or 1700 lbs.

reversing the process, by taking moments about R_2 we
h (load) 2000 lbs. × (leverage) 17′ = 34000 lbs.

1 R_1 = 34000 lbs. divided by its leverage or 20′ = 1700 lbs.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

Case VI.

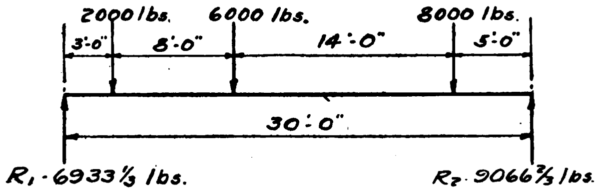


Figure No. 12

Taking moments about R_1 we have

load × leverage = moment of force

2000″ × 3′ 0″ = 6000
6000″ × 11′ 0″ = 66000
8000″ × 25′ 0″ = 200000

Total moment of forces 272000

And R_2 = moment of force ÷ leverage

272000 ÷ 30′ 0″ = 9066⅔ lbs.

Therefore R_1 must equal [(2000 + 6000 + 8000)—9066⅔] = 6933⅓ lbs.

Or taking moments about R_2

load × leverage = moment of force

8000 × 5′ 0″ = 40000
6000 × 19′ 0″ = 114000
2000 × 27′ 0″ = 54000

Total moment of force 208000

And R_1 = 208000 ÷ 30′ = 6933⅓ lbs.

Case VII.

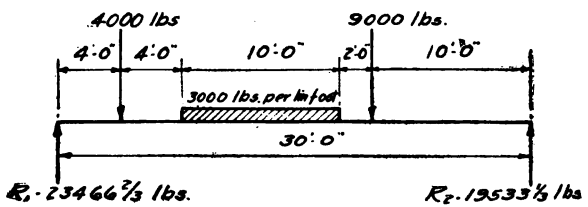


Figure No. 13

GENERAL DESCRIPTION OF BEAMS AND JOISTS

Taking moments about R_1 we have

load × leverage = moment of force

4000 × 4′ 0″ = 16000

(Assume the uniform load concentrated at its center.)

30000 × 13′ 0″ = 390000

9000 × 20′ 0″ = 180000

Total moment = 586000

And $R_2 = 586000 \div 30' 0'' = 19533\frac{1}{3}$.

Therefore R_1 must equal $(4000 + 30000 + 9000) - 19533\frac{1}{3}$ or $23466\frac{2}{3}$ lbs.

Case VIII.

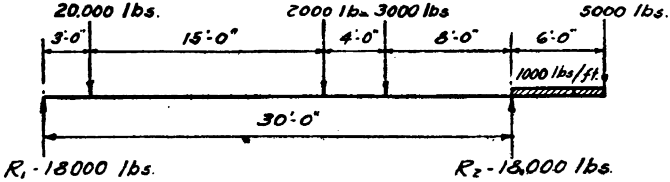


Figure No. 14

Taking moments about R_1

load × leverage = moment of force

20000 × 3′ 0″ = 60000

2000 × 18′ 0″ = 36000

3000 × 22′ 0″ = 66000

uniform load 6000 × 33′ 0″ = 198000

5000 × 36′ 0″ = 180000

Total moment = 540000

And $R_2 = 540000 \div 30' 0'' = 18000$.

Therefore $R_1 = [(20000 + 2000 + 3000 + 6000 + 5000) - 18000]$ or 18000 lbs.

Taking moments about R_2 we have

Positive moments acting downward on R_1.

3000 × 8′ 0″ = 24000

2000 × 12′ 0″ = 24000

20000 × 27′ 0″ = 540000

588000 (over)

GENERAL DESCRIPTION OF BEAMS AND JOISTS

Negative moment beyond R_2 tending to relieve or decrease load on R_1, subtracted.

uniform load	6000 ×	3′ 0″ =	18000	
	5000 ×	6′ 0″ =	30000	48000
				540000

And $R_1 = 540000 \div 30'\,0'' = 18000$ lbs.

The foregoing illustrations establish the fact that reactions can readily be calculated by resolving the loads and reactions into moments of force.

22. Simple Beams.

A simple beam is a beam resting on a support at each end, and is not tied in or restrained at its ends.

23. Cantilever Beams.

A cantilever beam is a beam either or both ends of which overhang its supports. The overhanging ends of beams in cases IV and VIII, pages 258 and 261 are types of cantilever beams. Beams with one end held or restrained in a wall or by being secured to a column or other structural member, as shown in figures 15 and 16, are also cantilever beams.

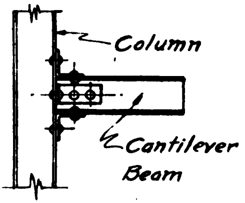


Figure No. 15

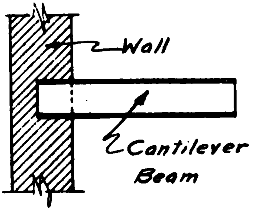


Figure No. 16

24. Continuous Beams.

A continuous beam is a beam resting on two or more supports as shown in Fig. 17.

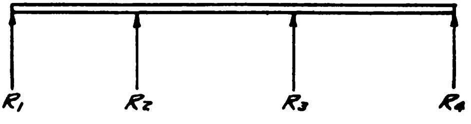


Figure No. 17

GENERAL DESCRIPTION OF BEAMS AND JOISTS

25. Restrained Beams

A restrained beam is a beam the ends of which are not free, such as one with both ends built into masonry walls or secured top and bottom to columns or other vertically braced members.

SHEAR

26. Shear Defined

Shear is the internal stress in a body which resists the tendency of two adjacent parts to slide on each other, due to the action of two equal and parallel external forces, called shearing stresses, acting on opposite sides of the plane of shear.

We have this action as a general principle, exemplified in a pair of shears or scissors with the two blades adjacent to each other, one tending to hold a portion of the material in a fixed position, and the other to force an adjacent portion of the material to the extent of causing it to slide by or shear off.

In joists, beams and girders there is a positive like tendency to shearing in both vertical and horizontal planes caused by the internal resisting stresses and the external load forces.

27. Vertical Shear

We have previously described the tendency of beams to break by bending, typified by applying a load on the beam between supports. The load may be applied at any point or points and develop this tendency to break by bending.

We may, however, apply a heavy load at some point or points on a short beam or near the end of a long beam and cause the beam to fail at or near the point of load application by the breaking down of the beam structure in a similar manner to the cutting of the fabric previously described.

The beam is presumably designed to safely carry the applied d or loads, therefore at any point on the beam the resistance the beam should provide a practically rigid member which n be likened to the blade of the shears holding a portion of e material in a fixed position, and the load on the beam as erting the force of the other blade tending to sheer or separ e the beam structure. These two conditions are illustrated in gs. 18 and 19. The shearing failure being based on vertical ear.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

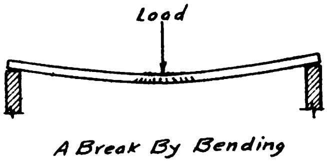


Figure No. 18

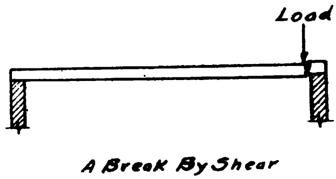
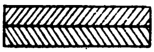


Figure No. 19

28. Horizontal Shear

The tendency towards the decreasing of the strength, or the failure of beams by horizontal shearing can readily be seen and understood by laying two yard sticks on top of each other thus,



and supporting them at the ends on chair backs or other supports, and then hanging a load of sufficient weight in the center of the sticks to cause a sag or deflection of 2 or 3 inches, you will find that the surfaces of the sticks have slipped on each other in a similar manner to that shown in Fig. No. 20.

Figure No. 20

The same thing happens if three or four or more yard sticks are used, laying them on top of each other loosely, and with proportionately heavier load.

Also note that the sticks all act together, or the two top sticks slide on each other practically the same as the two lower sticks.

Assuming the sticks 1 inch wide and ¼ inch thick, note the sliding effect of four sticks on each other under a load which will cause say 3 inches deflection, then place the same four sticks side by side in a vertical position as shown in Fig. 21, and apply the same load and there will be much less deflection, yet we have the same four sticks and therefore the same amount of material, but different ditions.

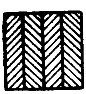


Figure No. 21

The essentially different condition is the increas the depth of the unit section, the one beam 1 i deep being stronger than the four beams ¼ i deep each. This is because the resisting value of the unit b is based upon moments of force, which moments increase rap with increase of leverage, or depth.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

Again take these four yard sticks and drill a series of holes about the size of a match stick, 2 or 3 inches apart throughout the length of the yard sticks thus,

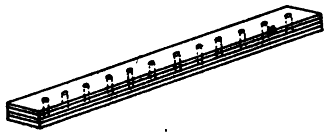


Figure No. 22

take two match sticks and insert them in the end holes of the four sticks, as shown in Fig. 23, and you will find that upon again loading the yard sticks, that the match sticks will be broken off or crushed between the yard sticks as they deflect from a level line. This shows that this slipping or sliding of the surfaces is a very decided factor.

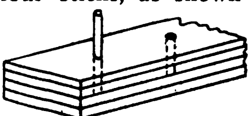


Figure No. 23

If you insert tight fitting nails in a number of the holes near the end of the yard sticks you will find that it will be possible to overcome this slipping or the tendency to shear and produce a built up beam with stiffness equal to the four yard sticks placed in a vertical position.

A further fact will be developed by placing either a match stick or a nail in the center hole in the yard sticks, as shown in

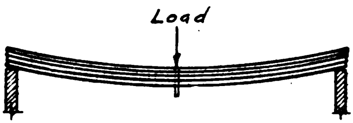


Figure No. 24

F . 24, with the load also located at the same point. It will be s n that the slipping of the yard sticks on each other will not be o -come, nor will the match stick be broken or crushed.

is shows that there is no sliding or shearing at this one p .t. Thus proving the statement that there is no shear (med as zero) under a centrally located concentrated load.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

29. Concentrated or Distributed Loading

In the case of a single load applied at one point the tendency to shear or slip is the same in intensity throughout its length from the load to either support. If the load is not applied in the center of the beam the tendency on each side of the load is different, and in proportion as the reactions R_1 and R_2 differ.

If the load is in the center of the beam the reactions and the tendencies to shear are equal on each side of the load.

In the case of uniformly distributed loads or in fact any distributed loading the intensity of the shearing tendencies increases proportionately with the load from some point in the beam at zero, to the support at which point it is maximum.

30. Shearing in Various Types of Beams

While beams and girders are frequently formed by spiking or bolting together a number of joists with the various members in a vertical position, the usual types of beams or girders are of one piece of material, being either cut from a wooden log or rolled into shape from structural steel bars.

In beams of this type we do not have the distinct layers or separate sheets of materials as with the assembly of yard sticks, but failure of beams show the same tendencies toward slipping or shearing apart of portions of the structure of the beam.

This shearing tendency also acts in a vertical direction. Therefore these two shearing tendencies, horizontal and vertical, must be considered in beam and girder design and construction.

In the design of reinforced concrete beams and plate girders the consideration of both vertical and horizontal shearing stresses is an important item, as such beams and girders are designed in detail by the engineer designing the structure.

The values of both concrete and steel in resisting shearing stresses are known and can readily be applied to the beam design in question.

These values are also known in the case of wood beam d rolled structural steel shapes, but these beams being of stan d sizes and shapes, the resistance to shear and bending are alr ly calculated and published in hand books, consequently fo ll practical purposes designing with such beams involves m ly the selecting of beam sections from tabulated information.

From these experiments we have demonstrated the follo g facts:

GENERAL DESCRIPTION OF BEAMS AND JOISTS

First, that there is a tendency throughout the depth of the beam for one portion to slip or slide on another portion.

Second, that the tendency is practically the same at any point in the depth of the beam.

Third, that there is one point in beams where there is no tendency toward shearing.

Fourth, that by inserting a weak material in the form of stirrups, pins or dowels, the shearing tendency will break or crush these weak members. It is also true that an over strength material may be inserted which will not fail itself, but will cause the fabric of the beam surrounding the over strength member to crush, and thereby produce deflection.

Fifth, with a single concentrated load at any point the intensity of the shearing tendency is constant on either side from the load to the point of support.

Sixth, with a distributed load the intensity of the tendency to shear varies as the loading and reactions change.

The vertical shear at any section as at a-b

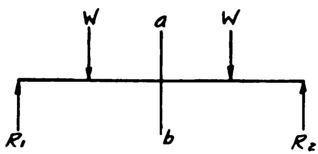


Figure No. 25

is equal to either reaction minus the sum of the loads between that reaction and the point or section in question, thus the shear at a-b equals $R_1 - W$ or $R_2 - W$.

It follows from the above that:

First, for a uniformly distributed load on the beam the maximum ar is at the supports, and is equal to one-half the total load the beam, or to the reaction at each support. The minimum ar is at the center of the beam and equals zero.

Second, for a beam with a load concentrated at the center, the ximum shear equals one-half the load on the beam, and is iform throughout the beam.

Third, the shear in a simple beam cannot be greater than the ater reaction.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

Fourth, the calculation of shearing stresses in simple beams involves only the loads between the two supports in question.

31. Examples

Case I (see Case I, page 257).

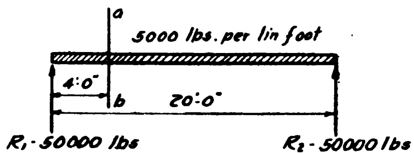


Figure No. 26

As described in the first statement above noted, the shear at at either support is 50,000 lbs., and in the center is zero. At point a-b the shear equals (R_1) 50,000 lbs. less (5,000 lbs. x 4') or 30,000 lbs.

Case II (see Case II, page 258).

The shear at any point between the reaction and the load on each half of the beam is 5,000 lbs. as described in the second statement above noted, and passes thru zero at the center of the beam.

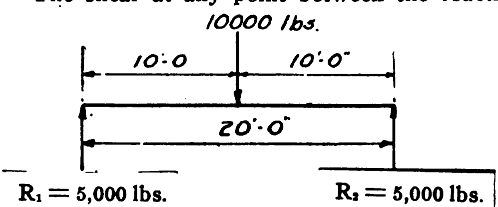


Figure No. 27

Case III (see Case III, page 258).

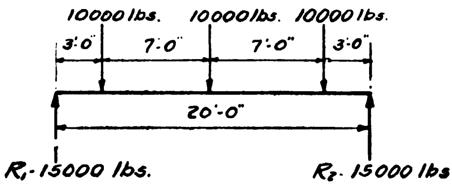


Figure No. 28

The shear is uniform throughout the 3 feet at each en[illegible] of the beam at 1[illegible] lbs., and unil[illegible] throughout on [illegible] 7 foot section a[illegible] the center line [illegible]000 lbs., and pa[illegible] through zero [illegible] the center load

GENERAL DESCRIPTION OF BEAMS AND JOISTS

Case IV (see Case IV, page 258).

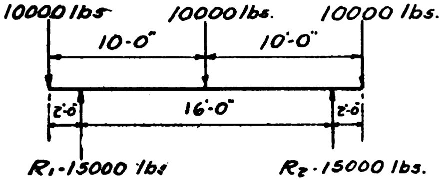


Figure No. 29

The shear on each of the two 2 foot sections of the beam extending beyond the supports is uniform at 10000 lbs. and uniform at 5000 lbs. between the center load and the supports on each side of the load, and passes through zero under the center load.

Case V (see Case V, page 259).

The maximum shear is at the support R_1, and is uniform at 1700 lbs. from that point to the first load to the right at which point the shear passes through zero, or changes sign from positive (+) to negative (—).

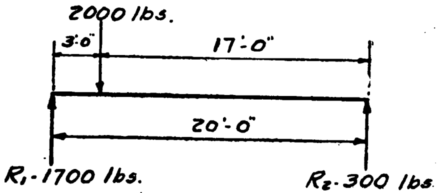


Figure No. 30

The shear from the load to the reaction R_2 is uniform at 300 lbs.

Case VI (see Case VI, page 260).

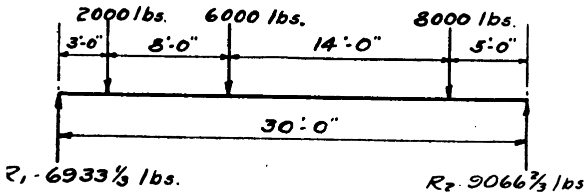


Figure No. 31

e maximum shear is uniform for 5 feet from R_2 at 9066⅔ lb nd passes through zero under the 6000-lb. load. The shear

GENERAL DESCRIPTION OF BEAMS AND JOISTS

at a point 9 feet from R_2 = 9066⅔ lbs. less 8000 lbs. or 1066⅔ lbs.

Case VII (see Case VII, page 260).

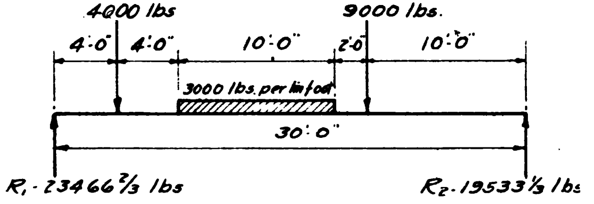


Figure No. 32

The maximum shear is uniform in the four feet to the right of R_1 at 23466⅔ lbs., and passes through zero 14.49 feet from R_1, being figured as follows:

R_1 =	23466⅔ lbs.
less load 4 feet to right	4000 lbs.
Reducing the shear to	19466⅔ lbs.

The next loading is uniform and reduces each foot by 3000 lbs. or 19466⅔ ÷ 3000 = 6.49 ft. from the 8′ 0″ point to the right of R_1.

Therefore the distance is

4.0′ + 4.0′ + 6.49′ or	14.49′

Figuring from R_2 we have:

R_2 =	19533⅓ lbs.
less load 10 ft. to left @	9000 lbs.
Reducing the shear to	10533⅓ lbs.

Then the uniform load reducing each foot @ 3000 lbs.) 10533⅓ lbs.
equals 3.51 feet

Therefore the distance is

10.0′ + 2.0′ + 3.51′ or	15.51′
Total length =	30.00′

GENERAL. DESCRIPTION OF BEAMS AND JOISTS

Case VIII (see Case VIII, page 261).

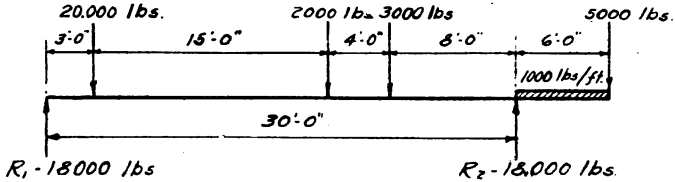


Figure No. 33

Shearing stresses taken from R_1—

for 3 feet from the right of R_1, maximum at	18000 lbs. +
from 3 to 18 feet from R_1	2000 lbs. —
from 18 to 22 feet from R_1	4000 lbs. —
from 22 to 30 feet from R_1	7000 lbs. —

At the right-hand side of R_2 the maximum shear is the full cantilever load or 11,000 lbs. as there is no other support for the load, this shear decreases from that point as the uniform load decreases, and is 5000 lbs. at the end where the concentrated load is applied. When considered from R_2 the shearing stresses will have the reverse signs from those noted above as from R_1.

The horizontal shear per any lineal inch of beam is usually taken as equal to the vertical shear divided by the effective depth of the beam at that place. This subject of horizontal shear is treated in greater detail in the chapter on the Details of Reinforced Concrete Beam Design.

BENDING MOMENTS

32. Bending Moments Defined

Bending moments compare with and are of the same unit values as the resisting moments which are described in Section 16, and this comparison is previously referred to in the fifth paragraph of Section 14.

It is usual to make a general layout of the building to be designed, and compute the loads carried by joists, beams, girders, etc., and then select or design members properly proportioned and of sufficient strength to carry the loads imposed. Joists, simple beams, girders and columns should be considered in the order named, because joists are usually supported on simple be: ; or walls and simple beams on girders or walls and girders

GENERAL DESCRIPTION OF BEAMS AND JOISTS

on columns or walls, and the reactions from the lighter members constitute loads on the heavier members.

The maximum bending moment is what we require in investigating beams of uniform section, and is therefore the quantity to be obtained in all cases.

The bending moment of a beam at any section is the name given to the algebraic sum of the moments of the external forces on either side of the section in question, with reference to a point of the section.

For any beam the bending moment at any point or section a

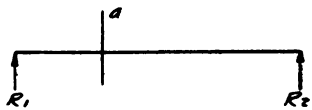


Figure No. 34

is the algebraic sum of the moments of the external forces to the right of a, or to the left of a, considering the point a as the point about which moments are taken. Therefore as previously suggested in section 20 we must picture in our minds the point about which moments are taken as the load W at point A in figure No. 4 and the forces at either reaction as tending to rotate about that point.

The maximum bending moment in a simple beam is where the vertical shear passes through zero going out from either support and is always under a load, it is therefore first necessary to know or determine the point where the vertical shear passes through zero by the methods previously given, and then take this point as the point a above referred to.

A simple beam is a beam resting on a support at each end, and which is not tied or restrained at its ends.

A uniform load is composed of an infinite number of concentrated loads. The ends of joists spaced at 24-inch centers or less are figured as a uniform load on the beam.

The term span in building construction means the dis e from center to center of supports. The distance between - ports is termed as the clear span.

The bending moment is usually figured on the basis o clear span or from the face of supports, in the case of be which are secured at the ends either to other structural men or imbedded in masonry walls or piers. In the case of

GENERAL DESCRIPTION OF BEAMS AND JOISTS

freely supported the length shall be the distance between the centers of supports. The span length for continuous beams shall be the clear distance between faces of supports. Where brackets are used the span shall be measured from the point where the bracket increases the beam depth by one-third.

33. Bending Moment Problems

1st problem. For a simple beam with a load concentrated at the center we have the condition as shown in Fig. 35.

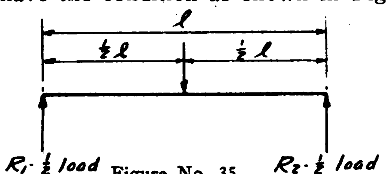


Figure No. 35

As in Case II, page 258, the reactions each equal ½ of the load.

As in Case II, page 268, the shear passes through zero in the center under the load.

Therefore the point a is located in the center, and the bending moment equals (R_1 or R_2) ½W multiplied by (½ of the length) ½L, which also may be expressed as $\frac{W}{2} \times \frac{L}{2} = \frac{WL}{4}$ = the maximum bending moment.

If L is used in feet the bending moment will be in foot pounds, and if L is used in inches the bending moment will be in inch pounds.

This expression always stands for the bending moment in the case of a concentrated load in the center of a beam, or in other words we multiply the load on the beam by its length and divide this product by 4. We can easily find the total moment including the weight of the beam by adding the moment produced by the uniform load or weight of the beam as hereafter described.

2nd problem. For a single load at any point we have the condition as shown in Fig. 36.

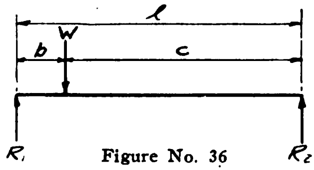


Figure No. 36

GENERAL DESCRIPTION OF BEAMS AND JOISTS

See Case V, page 259, as to the determination of R_1 and R_2.

See Case V, page 269, noting that the shear passes through zero under the load, this also locates the point a about which moments are taken.

In Case V, the maximum bending moment based on R_1 equals $R_1 \times b$ or 1700 lbs. x 3 feet = 5100 foot pounds, or 1700 lbs. $\times$ 36 inches = 61200 inch pounds.

The maximum bending moment based on R_1 equals $R_2 \times c$
or 300 lbs. $\times$ 17 feet = 5100 foot pounds,
or 300 lbs. $\times$ 204 inches = 61200 inch pounds.

The above expressed in algebraic form to make it describe any load and length conditions would be: The maximum bending moment equals $R_1 \times b$ or $R_2 \times c$.

Note: The resulting bending moment is always the same, whether figured to the right or left of the point of zero shear.

3rd problem. For a simple beam with a uniform load, we have the condition as shown in Fig. No. 37.

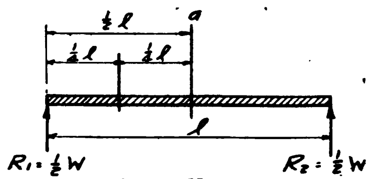


Figure No. 37

As in Case I, page 257, the reactions each equal ½ of the load.

As in Case I, page 268, the shear passes through zero in the center of the beam.

Therefore moments are based on the center of the beam.

We have first, R_1 or R_2 = ½W (W/2) acting about the lever arm ½L (L/2) tending to produce rotation or break the beam, but we also have acting against this, tending to counteract the rotating effect of the reaction, the load between the reaction the point a, or ½W (W/2) about its lever arm, i. e.—the ce of this load which equals ¼L (L/4).

Therefore gathering these together we have:
$(W/2 \times L/2) - (W/2 \times L/4)$ or $WL/4 - WL/8 = W$

Therefore the maximum bending moment for a simple b with a uniform load is always expressed by the following, W

GENERAL DESCRIPTION OF BEAMS AND JOISTS

In other words we multiply the weight of the load on the beam by its length and divide this product by 8.

This bending moment added to the moment in problem 1 will give the total moment produced by the weight of the beam itself plus the moment for a concentrated load on the center of the beam.

The first three problems above given really cover the general principles involved in determining the bending moment.

The general idea is to determine the effect which might be produced by assuming the load as the fulcrum, and the reaction as tending to rotate around it and break the beam. Assuming a single concentrated load we have only the reaction and the load at its point of application to consider, and as in problem No. 2 the bending moment is really nothing but the moment of force of the reaction acting about the point of application of the load.

As the reactions are proportional to the load and the location of the load, the resulting bending moment is the same on either side of the load.

And again the resisting moment as explained in section 16 is really nothing but the moment of the internal forces in the beam acting about each other as the basis of their leverage.

The balance of the problems will be based upon a combination of loads illustrating a more general application of the principles already given: when two or more loads are applied to the beam, and wherein we consider not only the reactions but counteracting loads between the reactions and the point about which moments are taken.

This counteracting load is described in the third problem, but is there introduced into a set formula for a uniformly distributed load, the following problems will illustrate the point as applied in a general way.

4th problem.

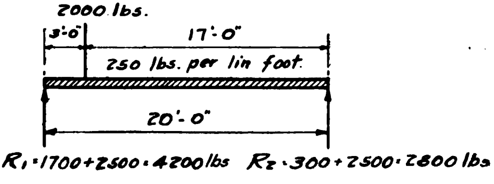


Figure No. 38

GENERAL DESCRIPTION OF BEAMS AND JOISTS

$$R_1 = \left[\frac{17 \times 2000}{20} + \frac{5000 \times 10}{20}\right] = (1700 + 2500) = 4200 \text{ lbs.}$$

$$R_2 = \left[\frac{3 \times 2000}{20} + \frac{5000 \times 10}{20}\right] = (300 + 2500) = 2800 \text{ lbs.}$$

Zero shear from R^1 = 4200 lbs. — [2000 lbs + (250 × X)] = 0
in which case X = 8.8 feet.

Zero shear from R_2 = 2800 lbs. — (250 × X) = 0
in which case X = 11.2 feet.

Therefore the point a is 8.8 feet from R_1 and 11.2 feet from R_2.

The maximum bending moment from R_1 therefore equals:

R_1 or (4200 lbs. × 8.8 ft.) less the two counteracting loads as follows (2000 lbs. × 5.8 ft.) + (250 lbs. × 8.8 ft. × 4.4 ft.) which should be written as follows:

(4200 × 8.8′) — [(2000 × 5.8′) + (250 × 8.8′ × 4.4′)]
or 36960 lbs. — (11600 — 9680 lbs.) = 15680 foot lbs.

From R_2 = (2800 lbs. × 11.2′) — (250 lbs. × 11.2′ × 5.6′)
or 31360 lbs. — 15680 lbs. = 15680 foot lbs.

If however, we take the bending moment for the concentrated load alone, in the second problem = 5100 foot pounds and add the uniform load based on WL/8
we have (250 × 20 × 20) ÷ 8 = 12,500 foot pounds

Total = 17,600 foot pounds

or more with the two loads considered separately and added together, we should use the combined calculation resulting in the lower value.

5th problem.

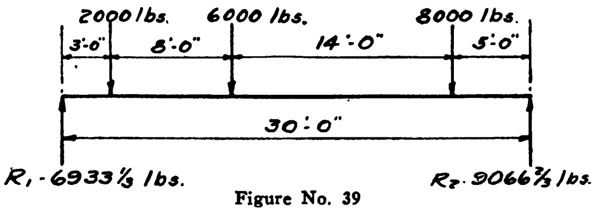


Figure No. 39

GENERAL DESCRIPTION OF BEAMS AND JOISTS

See Case VI, page 260, where the reactions are figured.

See Case VI, page 269, where the shear is noted as passing through zero under the 6000 lb. load.

The maximum bending moment from R_1 equals
R_1 or (6933⅓ lbs. × 11′) — (2000 lbs. × 8′) or 60266 foot lbs.

And from R_2 equals
R_2 or (9066⅔ lbs. × 19′) — (8000 lbs. × 14′) or 60266 foot lbs.

6th problem.

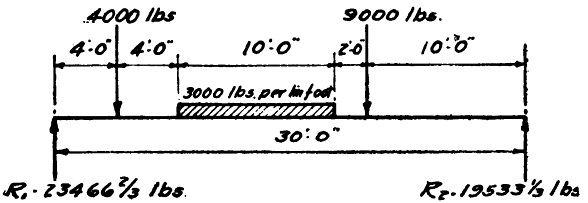


Figure No. 40

See Case VII, page 260, where the reactions are figured.

The shear passes through zero at a point approximately 14½ ft. from R_1 and approximately 15½ ft. from R_2.

The maximum bending moment from R_1 equals

R_1 or (23467 lbs. × 14½′) — [(3000 lbs. × 6.5′ × 3.25′) + (4000 lbs. × 10½′)] = 234,896 ft. lbs.

And from R_2 equals

R_2 or (19533 lbs. × 15½′) — [(3000 lbs. × 3.5′ × 1.75′) + (9000 lbs. × 5½′)] = 234,887 ft. lbs.

34. Resisting Inches

The development of the formula for determining the strength of beams brings out the fact that the resisting moment of the section (any joist, beam or girder) can be expressed as follows,

I > c
—— = Resisting moment.
(

GENERAL DESCRIPTION OF BEAMS AND JOISTS

In which I equals the total moment of inertia of the section. The value of S equals the stress upon the most remote fibre or the modulus of rupture of the material described in Section 16. The letter C represents the distance from the neutral axis to most remote fibre above referred to.

The moment of inertia indicates the value of the material in the beam based on the distribution or location of the material as related to the neutral axis or center of action of the section.

Or in other words, the strength of a supporting member depends not only upon the area of material in the member, but also upon the form or shape of the member. The parts of a member which are most remote or farthest away from the neutral axis are the more effective in resistance per square inch of section. For this reason we find the best design of steel beams to be one with a thin web and enlarged flanges at the extreme ends of the web. By referring to the published tables of the properties of steel I beams we find the moment of inertia of a 10", 35-lb. I beam to be 145.8 and the moment of inertia of a 12", 35-lb. I beam 227.0. As the total weight per lineal foot is the same, the total area must be the same, but the moment of inertia increases with greater depth. We can also demonstrate the difference in supporting powers by rolling up a piece of note paper into a small roll, say to pencil size or smaller, and also rolling a similar size sheet of note paper into a roll say 1½ or 2 inches in diameter. Stand these on end and see what they will support by loading them with books or other weight, it will be seen that the larger roll although of the same area of material as the smaller, will support a much larger load, and will have a decided advantage in longer lengths, owing to its larger girth.

Referring again to the formula $\frac{I \times S}{C}$, we can by simply eliminating S determine a unit value based on the section itself and termed the resisting inches or section modulus. Again referring to the 10" 35-lb. and 12" 35-lb. I beams, which are symmetrical sections, we find by dividing the moment of inertia (I) by the distance to the extreme fibre from the neutral axis or center we have as follows:

10", 35-lb. I beam $\frac{I}{C} = \frac{145.8}{5} = 29.2$ and for

GENERAL DESCRIPTION OF BEAMS AND JOISTS

12″, 35-lb. I beam $\frac{I}{C} = \frac{227.0}{6} = 37.8.$

These figures 29.2 and 37.8 will be found in the steel hand book tables as the section modulus of these beams, and the same is true for joists, beams or girders of any shape or size, and you will find similar tabulations for plate girders, wood beams and joists, etc., wherever the properties are listed. The tabulation of the properties of Berloy Metal Lumber sections will be found in the fore part of this book.

By taking this value of S which has been eliminated from the above mentioned formula and dividing it into the bending moment produced by any system of loading we can likewise change that figure into the required resisting inches of section.

The values of S are known and published in hand and text books. If a steel beam is desired to carry the load divide by 16000 lbs., which is the usual value basis of S for steel, and then select a steel beam with similar resisting inches value, or section modulus.

If a wood beam is desired divide by its value of S, and select a wooden beam with similar resisting inches value, or section modulus.

Note that a bending moment of 407200 inch pounds will require (467200/16000) 29.2 resisting inches in a steel member, but if a wood beam is to be used at say a modulus of rupture or value of S at 1200 lbs. per square inch, the beam value in resisting inches will be (467200/1200) approximately 389 R. I. and will require a 14″ × 14″, 10″ ×16″ or 8″ × 18″ member (see page 8 Southern Yellow Pine Manual, Seventh Ed. 1919). These are practically correct, being as close as can be selected from stock material.

This method of reducing requirements into resisting inches, and then selecting a beam of the desired material with a similar value in section modulus is a usual and desirable way of designing joi[illegible]s, beams and girders.

35. [illegible]imitations in Design

[illegible]ere are two limitations in the design of steel beams which sh[illegible]d be kept in mind and considered when necessary.

[illegible]*st.* The relationship of width of flange to length of span. A de[illegible]tion of this point is given on page 191, Carnegie Pocket

GENERAL DESCRIPTION OF BEAMS AND JOISTS

Companion, 22nd edition. Unless the beams are properly braced sideways the carrying values should be regulated as noted in the table on the page referred to.

Second. In short beams with heavy loads it is possible to cause the beams to fail by shear at the ends or at the point of application of the load. Allowable web shearing values are given on page 196 of the Carnegie book referred to above.

If the principles of design and the limitations involved are not thoroughly understood, all designs should be checked by a competent engineer.

REINFORCED CONCRETE BEAMS

36. Types of Structures

In the design of reinforced concrete beams we encounter questions, which, while also involved in wood or steel beams, are not generally considered in such detail as they are in reinforced concrete beam design.

In wood and steel beam design we have the same material to consider in both top and bottom flanges, and these materials have established values which are also the same in both flanges.

Beams composed of but one material of like value top and bottom, usually designed and fabricated with a section or shape symmetrical about the center line, between top and bottom, in such beams the neutral axis (see Sec. 5) is also in the center of the beam.

Among the structures of unsymmetrical section are included trusses, trussed beams and reinforced concrete beams. Trusses are composed of a skeleton framework the various members of which are designed to resist the tension, compression, and shearing stresses. These stresses are readily computed by simple mathematics or the easily understood graphic method, descriptions of which may be found in books on structural engineering.

Typical trusses are illustrated in the following drawings:

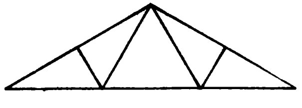


Figure No. 41-A

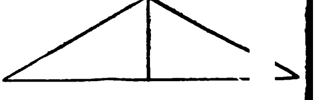


Figure No. 41-B

GENERAL DESCRIPTION OF BEAMS AND JOISTS

Trussed beams are composed of a simple beam (usually wood) strengthened by a trussed rod or chord, typically as shown in the following drawings:

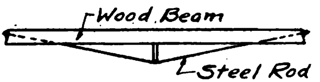


Figure No. 42-A

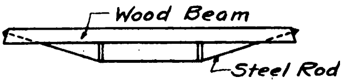


Figure No. 42-B

Such beams are also easily calculated by simple mathematics or the graphic method.

37. Reinforced Concrete

Reinforced concrete beams are composed of concrete (poured or molded into shape in wood or iron forms) and including steel reinforcing members. The concrete is designed to resist the compressive and shearing stresses and the steel to resist the tensile stresses. Concrete is not considered as resisting tensile stresses, but the steel is frequently designed to assist in the resistance of shearing and compressive stresses besides resisting tension. This subject is covered more fully in the chapter on the design of reinforced concrete beams.

We have here a beam in which the principle tensile and compressive stresses are resisted by different materials, which materials also have different unit values, and different shapes and quantities in the top and bottom flanges, and the neutral axis is therefore not in the center of the beam.

The method of calculating beams includes determining the location of the neutral axis. In beams of like material and uniform s tion in top and bottom flanges the neutral axis is in the center, b in beams of unlike material and different section in top and b tom flanges the neutral axis is not in the center. Reinforced c icrete beams are of this latter class.

he location of the neutral axis is primarily dependent upon t relative elasticity and resisting values of the materials in the fl ges of the beams.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

It has been determined by repeated tests that for a stress per pound per square of cross section the steel will stretch or compress about 1/15 as much as an equal section of area of concrete, therefore the ratio of 15, based on the moduli of elasticity of concrete and steel, has been almost universally adopted as the ratio used in reinforced concrete design, and which factor is assumed as constant for 1-2-4 stone or gravel concrete and steel reinforcing bars. This ratio (Es ÷ Ec) is usually designated by the notation n. The other factors involved, i. e.—the tensile and compressive values of the materials used, may, however, vary in accordance with the governing regulations, nature of materials used, or, the judgment of the designer.

The underlying principles previously described, however, apply in the design of reinforced concrete beams, and such beams of a predetermined size and shape may be reinforced with steel rods so that the resulting beam will carry the desired load; or beams of undetermined size may be specially designed to carry the desired load with maximum economy in materials of construction.

The specially designed beams are based upon the use of the minimum quantity of concrete and reinforcing steel, which quantities are proportioned by their allowable powers of resistance to the stresses to which they are subjected.

In reinforced concrete buildings it is not unusual for a number of beams of different lengths and loadings to be made of uniform size for simplicity and economy in form work, or possibly for uniformity in appearance. In such cases it is usual to carefully design the beam size for the group, to suit the maximum requirement, and then reduce the quantity of steel reinforcemr in the other beams to suit their requirements.

In designing the beam of maximum requirement the si of the beam and the area of reinforcing steel are so selected . to fully develop the maximum allowable unit stress in both ıa- terials. Beams so designed are said to be reinforced wit' he critical percentage of steel or are termed as balanced be-

GENERAL DESCRIPTION OF BEAMS AND JOISTS

38. Outline of Reinforced Concrete Beam Design

In designing rectangular reinforced concrete beams with the critical percentage of steel we proceed as follows:

1—Locate the neutral axis, based on the value of the materials.

2—Determine the area of concrete comprising the top or compression flange (the material above the neutral axis).

3—Determine the value of the top flange in compression, based on its area multiplied by the average value of the material.

4—Locate the center of action of the concrete in the top flange.

5—Determine the effective depth of the beam (the distance between the center of action of the steel reinforcement and the center of action of the concrete compression flange (jd).

6—Determine the resisting moment of the concrete, by multiplying the value of the concrete in compression by its lever arm (the effective depth of the beam or jd).

7—Determine the amount of steel reinforcement required to develop this resisting moment, by dividing the resisting moment by the product of the value of steel per square inch and its lever arm.

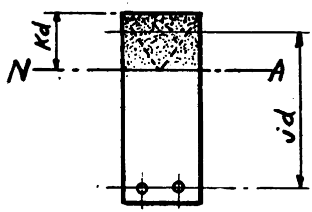


Figure No. 43

39. Unit Beam Constants and Coefficients

By carrying out the calculations involved in determining the above noted data based on a unit size beam, say 1 inch wide by 1 inch deep, we can develop ratios and constants, which may be applied to the design of any size rectangular beam based on varying values of material.

These values do not usually exceed steel at 16,000 or 18,000 lbs. and concrete 650 lbs. per square inch, and the ratio of the moduli of elasticity of steel to concrete or (Es ÷ Ec) is almost universally used in building construction as 15.

We have prepared 6 tables with values within the above limits which are reproduced on pages 288 to 293.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

TABLE A. VALUES OF k (n = 15)

Table A (page 288), gives the value of k based on various ratios p, which value of k multiplied by the effective depth of the beam (d) will locate the distance to the neutral axis of the beam from the top (item 1, outline of design). This value applies to either slabs, rectangular or tee beams.

TABLE B. VALUES OF j (n = 15)

Table B (page 289), gives the value of j based on various ratios p, which value of j multiplied by the depth of the beam (d) will determine the effective depth or lever arm of the beam, (item 5, outline of design). This value is correct for slabs, rectangular beams and for tee beams wherein the neutral axis is above or at the bottom edge of the flange. It also can be used to get very close results in other tee beams. See page 309.

TABLE C. STEEL AND CONCRETE STRESSES (Steel Max. 16,000 lbs. and n = 15)

Table C (page 290), indicates the stresses in steel and concrete (maximum values of steel at 16,000 lbs. and concrete at 650 lbs. per square inch) which are developed in rectangular beams based on the use of varying ratios of reinforcing steel (p).

TABLE D. STEEL AND CONCRETE STRESSES (Steel Max. 18,000 lbs. and n = 15)

Table D (page 291) indicates the stresses in steel and concrete (maximum values of steel at 18,000 lbs. and concrete at 650 lbs. per square inch) which are developed in rectangular beams based on the use of various ratios of reinforcing steel (p).

TABLE E. R CONSTANTS (Steel Max. 16,000 lbs. and n = 15)

Table E (page 292), based on rectangular beams with balanced reinforcement, with varying stress values of steel and concrete, but in no case exceeding a value of 16,000 lbs. on steel nor 650 lbs. on concrete, per square inch.

This table is a series of constants (R) involving the entire beam calculation as outlined on page 283, except the width (b) and depth (d) of the beam in question.

The constant (R) multiplied by the width (b) and depth squared (d^2) of any rectangular beam gives the total moment of resistance (M) of that beam or $Rbd^2 = M$.

In which calculation R includes in terms of the unit size beam either the total steel value in tension or the concrete value in compression multiplied by the lever arm or jd.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

The constants R given in the table are based on various ratios of reinforcing steel (p), in rectangular beams.

TABLE F. R CONSTANTS (Steel Max. 18,000 lbs. and n = 15)

Table F (page 293). The same notes apply to table E except that the maximum value of steel is 18,000 lbs. instead of 16,000 lbs. per square inch.

The value of concrete, however, remains at 650 lbs. per square inch.

40. Ratio of Steel (p)*

The ratio of reinforcing steel in a beam may be determined in a number of ways, such as:

First. Upon the basis of n and the maximum allowable values of the concrete and steel, which ratio is known as the critical ratio or percentage of steel, producing a balanced beam. Ratios (p) are given for various combinations of concrete and steel values in tables C and D as follows:

Table C (page 290), values of steel between 16,000 and 10,500 lbs. per square inch with a constant corresponding value of concrete at 650 lbs. per square inch. Also values of concrete between 650 and 201 lbs. per square inch with a constant corresponding value of steel at 16,000 lbs. per square inch, and n = 15 in both cases.

Table D (page 291), values of steel between 18,000 and 10,500 lbs. per square inch with a constant corresponding value of concrete at 650 lbs. per square inch. Also values of concrete between 650 and 226 lbs. per square inch with a corresponding value of steel at 18,000 lbs. per square inch, and n = 15 in both cases.

Second. Upon the basis of the ratio or percentage of the area of steel to the total area of concrete in a rectangular beam or As/bd.

Third. In tee beams wherein the neutral axis is either in or at the bottom edge of the top flange, and based upon the total area of an assumed size of rectangular beam of width equal to the width of the flange (b) and depth (d). In this case the concrete compression flange of the assumed size of rectangular beam is fully developed, and only sufficient concrete is required in the stem to properly protect the steel reinforcement, and transmit bond and shearing stresses from the steel to the top flange. See figure No. 44.

*This ratio is frequently referred to as a percentage of steel or As/bd.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

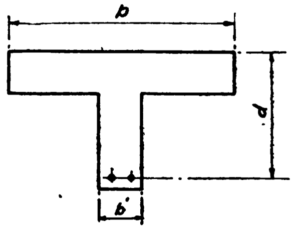


Figure No. 44

Fourth (approximate). In tee beams wherein the neutral axis lies in the stem of the beam a little below the top flange, and based upon the total area of an assumed size of rectangular beam of width equal to the width of the flange (b) and depth (d). In this case the concrete compression flange of the assumed size of rectangular beam is not quite fully developed, but an accurate redesign of the beam shows that the small amount of concrete cut out just above the neutral axis amounts to so little that the approximate value is sufficiently close to the actual as to be usable for all practical purposes.

The correct formula for the calculation of tee beams wherein the neutral axis lies in the stem is given on page 304. Another approximate method of calculating the area of steel reinforcing for tee beams is known as the plate girder formula, so called because the effective depth is assumed as the distance between the center of the top flange and the center of the reinforcing steel, in a similar manner to plate girder method of assuming an effective depth as between the center of gravity of the flanges. This method is more fully described in the chapter on the design of reinforced concrete beams, page 309.

The limiting values of steel and concrete above noted have been adhered to as being representative of values used in present day good practice.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

41. Economical Design.

The greatest economy in design is effected by the use of the critical percentage of steel or balanced reinforcement based upon the maximum allowable values of concrete and steel. It is therefore evident that the use of an excess quantity of either concrete or steel will decrease the stress per square inch on that material, and that a new percentage of steel must be determined, based upon the different proportion or combination of values.

In case of a larger amount of either steel or concrete than the proportion involved in the balanced beam, that material will naturally not be fully stressed to the maximum allowable value.

By refiguring the ratio of steel to concrete we will find a new value of p, and by referring to tables C and D we may determine the stresses in both the steel and the concrete; in table A, the value K; in table B, the value j; and in tables E and F, the constants R.

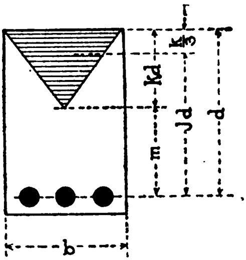
When the concrete is in excess, the ratio p and value k both decrease, resulting in an increased value of j with consequent longer lever arm (jd) and slightly increased effectiveness of the steel reinforcement. The advantage gained in the steel, however, is more than offset by the cost of the excess quantity of concrete.

Where the steel is in excess, the ratio p and value k both increase, resulting in a decreased value of j and consequent shorter lever arm (jd) and decreased effectiveness of the steel reinforcement, which accounts for the increased area required. As the concrete value per square inch cannot be increased, its area also must be increased and this lowers the neutral axis and effective depth of the beam, resulting in decreased efficiency of both materials. The first of the two conditions above described is the more economical; therefore as previously suggested, it is usually good policy to design a group of beams of uniform size on the basis of the size of a balanced beam for the maximum lc .

ıile the beams noted in the above two cases are not quite as e(ɔmical as beams with balanced reinforcement based on maxim n values, they have (by giving due consideration to the new ra) p) been as economically designed as is possible under the u alanced conditions. The disadvantage in cost will undoubtedly b(more than offset where uniformity and standardization have b(accomplished to any degree.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

TABLE A
CONCRETE DATA—FOR RECTANGULAR BEAMS



Neutral axis constants (k), based on values of p. The values of p in this table refer to the percentage of steel to the area of a rectangular beam, or

$$p = \frac{\text{area of steel}}{bd}$$, and n is constant at 15.

Combinations of fc and fs may vary.

Value of P	0	1	2	3	4	5	6	7	8	9
.001	.159	.166	.173	.179	.185	.191	.197	.202	.207	.211
.002	.216	.221	.227	.231	.235	.239	.243	.247	.251	.254
.003	.259	.262	.266	.269	.273	.276	.280	.283	.286	.288
.004	.292	.295	.298	.301	.304	.306	.309	.311	.314	.317
.005	.319	.322	.325	.327	.330	.332	.334	.337	.339	.341
.006	.344	.346	.348	$\boxed{.350}$	.353	.355	.357	.359	.361	.363
.007	.365	.367	.369	.371	.373	.375	.377	$\boxed{.379}$	.381	.383
.008	.384	.386	.388	.390	.391	.393	.395	.397	.398	.400
.009	.402	.403	.405	.407	.408	.410	.412	.413	.415	.416
.010	.418	.419	.421	.422	.424	.425	.427	.428	.430	.431
.011	.433	.434	.436	.437	.438	.440	.441	.442	.444	.445
.012	.446	.448	.449	.450	.452	.453	.454	.455	.457	.458
.013	.459	.460	.462	.463	.464	.465	.467	.468	.469	.4
.014	.471	.472	.474	.475	.476	.477	.478	.479	.480	.4

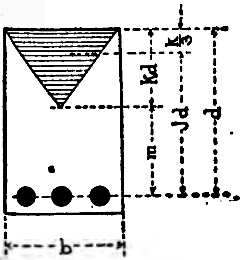
$\boxed{.350}$ Value of k for critical percentage of steel when fs = 18,000 lbs. per square i

$\boxed{.379}$ Value of k for critical percentage of steel when fs = 16,000 lbs. per square i

Concrete in both cases @ 650 lbs. per square inch.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

TABLE B
CONCRETE DATA—FOR RECTANGULAR BEAMS



Effective depth constants (j), based on values of p. The values of p in this table refer to the percentage of steel to the area of a rectangular beam, or

$$p = \frac{\text{area of steel}}{bd}$$, and n is constant at 15.

The effective depth = the given constant (j) × the depth (d) or jd in rectangular beams.

Value of P	0	1	2	3	4	5	6	7	8	9
.001	.947	.945	.942	.940	.938	.936	.934	.933	.931	.930
.002	.928	.926	.924	.923	.922	.920	.919	.918	.916	.915
.003	.914	.913	.911	.910	.909	.908	.907	.906	.905	.904
.004	.903	.902	.901	.900	.899	.898	.897	.896	.895	.894
.005	.894	.893	.892	.891	.890	.889	.889	.888	.887	.886
.006	.885	.885	.884	$\boxed{.883}$	.882	.882	.881	.880	.880	.879
.007	.878	.878	.877	.876	.876	.875	.874	$\boxed{.874}$	.873	.872
.008	.872	.872	.871	.870	.870	.869	.868	.868	.867	.867
.009	.866	.866	.865	.864	.864	.863	.863	.862	.862	.861
.010	.861	.860	.860	.859	.859	.858	.858	.857	.857	.856
.011	.856	.855	.855	.854	.854	.853	.853	.853	.852	.852
.01[illegible]	.851	.851	.850	.850	.849	.849	.849	.848	.848	.847
.01	.847	.847	.846	.846	.845	.845	.844	.844	.844	.843
.01	.843	.843	.842	.842	.841	.841	.841	.840	.840	.840

$\boxed{.88}$ Value of j for critical percentage of steel when fs = 18,000 lbs. per square inch.

$\boxed{.87}$ Value of j for critical percentage of steel when fs = 16,000 lbs. per square inch.

Con[illegible] in both cases at 650 lbs. per square inch.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

TABLE C
CONCRETE DATA—FOR RECTANGULAR BEAMS

Values of concrete and steel for different values of p, when the maximum unit stress in concrete is 650 lbs., and the maximum unit stress in steel is 16,000 lbs. per square inch, and n is constant at 15.

Value of P	0	1	2	3	4	5	6	7	8	9
.001	201	211	222	232	242	252	262	270	277	285
.002	294	302	311	319	327	334	341	348	355	362
.003	372	379	386	393	400	407	414	420	425	431
.004	440	446	452	459	465	470	476	482	488	494
.005	499	506	512	519	525	530	534	540	545	551
.006	557	563	569	574	580	585	591	596	602	607
.007	612	617	623	628	634	640	645	650 16,000	15840	15700
.008	15610	15500	15390	15280	15170	15060	14950	14840	14730	14620
.009	14530	14420	14300	14210	14110	14010	13900	13800	13700	13610
.010	13560	13480	13390	13310	13230	13150	13060	12980	12900	12820
.011	12780	12710	12640	12570	12500	12430	12360	12290	12220	12150
.012	12090	12020	11960	11900	11830	11770	11710	11650	11580	11520
.013	11460	11400	11350	11300	11240	11180	11130	11080	11030	10980
.014	10900	10860	10810	10790	10720	10680	10630	10590	10540	10500

Values above heavy line are unit stresses in concrete. Corresponding fs = 1[illegible] lbs.

Values below heavy line are unit stresses in steel. Corresponding fc = 650 l[illegible]

Values are based on the equations, $fc = \left[\frac{fs \times k}{n}\right] \div [1-k]$ and $fs = \frac{fc \times [1-k] \times n}{k}$

GENERAL DESCRIPTION OF BEAMS AND JOISTS

TABLE D
CONCRETE DATA—FOR RECTANGULAR BEAMS

Values of concrete and steel for different values of p, when the maximum unit stress in concrete is 650 lbs., and the maximum unit stress in steel is 18,000 lbs. per square inch, and n is constant at 15.

Value of P	0	1	2	3	4	5	6	7	8	9
.001	226	238	249	261	272	283	294	303	312	321
.002	330	340	350	360	368	376	384	392	400	408
.003	418	425	432	440	448	456	465	472	478	485
.004	495	502	509	516	522	528	535	542	549	556
.005	561	568	575	582	588	594	601	607	613	620
.006	628	634	640	645	17850	17700	17550	17400	17250	17100
.007	16950	16810	16670	16530	16400	16230	16120	15980	15840	15700
.008	15610	15500	15390	15280	15170	15060	14950	14840	14730	14620
.009	14530	14420	14300	14210	14110	14010	13900	13800	13700	13610
.010	13560	13480	13390	13310	13230	13150	13060	12980	12900	12820
.011	12780	12710	12640	12570	12500	12430	12360	12290	12220	12150
.012	12090	12020	11960	11900	11830	11770	11710	11650	11580	11520
.013	11460	11400	11350	11300	11240	11180	11130	11080	11030	10980
.014	10900	10860	10810	10790	10720	10680	10630	10590	10540	10500

Va above heavy line are unit stresses in concrete. Corresponding fs = 18,000 lbs.

Va below heavy line are unit stresses in steel. Corresponding fc = 650 lbs.

Va are based on the equations, $fc = \left[\frac{fs \times k}{n}\right] \div [1-k]$ and $fs = \frac{fc \times [1-k] \times n.}{k}$

GENERAL DESCRIPTION OF BEAMS AND JOISTS

TABLE E

CONCRETE DATA—FOR RECTANGULAR BEAMS

Constants R for use in the formula Rbd^2, for the determination of the maximum Resisting Moments of rectangular reinforced concrete beams based on varying values of steel and concrete for different percentages of steel (p), and n = 15.

Maximum values { steel at 16000 lbs. per sq. inch.
concrete at 650 lbs. per sq. inch.

Value of P	0	1	2	3	4	5	6	7	8	9
.001	15.15	16.60	18.05	19.50	20.95	22.45	23.90	25.35	26.80	28.25
.002	29.70	31.15	32.50	33.95	35.40	36.80	38.20	39.65	41.10	42.50
.003	43.90	45.35	46.60	48.10	49.45	50.90	52.25	53.60	55.00	56.40
.004	57.75	59.25	60.60	62.00	63.35	64.65	66.10	67.50	68.80	70.10
.005	71.50	72.95	74.35	75.60	77.00	78.20	79.60	81.00	82.40	83.80
.006	85.00	86.50	87.75	89.10	90.50	91.85	93.10	94.50	95.80	97.00
.007	98.45	99.80	101.0	102.3	103.9	105.0	106.3	$\boxed{107.5}$	108.0	108.3
.008	108.8	109.3	109.8	110.2	110.5	111.0	111.4	111.8	112.2	112.6
.009	113.0	113.4	113.8	114.2	114.5	115.0	115.3	115.6	116.0	116.4
.010	116.7	117.1	117.4	117.7	118.1	118.4	118.7	119.0	119.4	119.8
.011	120.1	120.4	120.7	121.1	121.4	121.8	122.1	122.5	122.8	123.1
.012	123.5	123.8	124.1	124.5	124.8	125.1	125.4	125.7	126.0	126.2
.013	126.4	126.8	127.1	127.3	127.5	127.8	128.1	128.3	128.6	128.9
.014	129.2	129.4	129.7	130.0	130.2	130.4	130.7	131.0	131.2	131.5

$\boxed{107.5}$ Value of R for critical percentage of steel, with concrete at 650 lbs., and steel at 16,000 lbs. per square inch.

GENERAL DESCRIPTION OF BEAMS AND JOISTS

TABLE F
CONCRETE DATA—FOR RECTANGULAR BEAMS

Constants R for use in the formula Rbd^2, for the determination of the maximum Resisting Moments of rectangular reinforced concrete beams based on varying values of steel and concrete for different percentages of steel (p), and n = 15.

Maximum values { steel at 18000 lbs. per sq. inch.
concrete at 650 lbs. per sq. inch.

Value of P	0	1	2	3	4	5	6	7	8	9
.001	17.05	18.80	20.35	21.95	23.70	25.25	26.90	28.55	30.15	31.80
.002	33.40	35.05	36.55	38.20	39.80	41.40	43.00	44.60	46.25	47.80
.003	49.40	51.00	52.45	54.10	55.60	57.25	58.80	60.35	61.90	63.50
.004	65.00	66.60	68.20	69.75	71.25	72.70	74.45	76.00	77.50	78.85
.005	80.50	82.10	83.60	85.00	86.65	88.00	89.60	91.20	92.70	94.30
.006	95.60	97.30	98.70	$\boxed{100.3}$	100.8	101.3	101.9	102.6	103.1	103.6
.007	104.0	104.5	105.1	105.6	106.0	106.5	107.0	107.5	108.0	108.3
.008	108.8	109.3	109.8	110.2	110.5	111.0	111.4	111.8	112.2	112.6
.009	113.0	113.4	113.8	114.2	114.5	115.0	115.3	115.6	116.0	116.4
.010	116.7	117.1	117.4	117.7	118.1	118.4	118.7	119.0	119.4	119.8
.011	120.1	120.4	120.7	121.1	121.4	121.8	122.1	122.5	122.8	123.1
.012	123.5	123.8	124.1	124.5	124.8	125.1	125.4	125.7	126.0	126.2
.013	126.4	126.8	127.1	127.3	127.5	127.8	128.1	128.3	128.6	128.9
14	129.2	129.4	129.7	130.0	130.2	130.4	130.7	131.0	131.2	131.5

$\boxed{.3}$ Value of R for critical percentage of steel, with concrete at 650 lbs., and steel at 18,000 lbs. per square inch.

PART 2

REINFORCED CONCRETE BEAM DESIGN

RECTANGULAR BEAMS

1 General—2 Location of Neutral Axis—3 Location of Neutral Axis at 650, 16,000 and 15—4 Effective Depth or (jd)—5 Flange Stress—6 Width Required—7 Reinforcing Steel—8 Balanced Reinforcement—9 Value of Constant (R).

CONTINUOUS AND DOUBLE REINFORCED BEAMS

10 Negative Moments, Lengths of Suspended Spans and Increased Value of Concrete—11 Double Reinforced Beams.

TEE SECTIONS

12 Solid Slab and Beam Type—13 Slab with Fillers—14 Calculation—15 Percentage of Reinforcement—16 Width of Stem and Concrete Protection—17 Girder Bars—18 Tapered Cores—19 Approximate Formula.

SHEAR AND BOND STRESSES

20 General Illustration—21 Vertical Shear—22 Horizontal Shear—23 Bond Stresses—24 Adhesion of Concrete—25 Bond and Shear in Continuous Beams.

ECONOMY IN DESIGN

26 Rectangular Beams and Slabs—27 Tee Beams 3 Comparative Tables.

REINFORCED CONCRETE BEAM DESIGN

NOTATION

S	=	Steel in tension, pounds per square inch.
C	=	Concrete in compression, pounds per square inch (maximum fibre stress).
n	=	Elasticity ratio, Es ÷ Ec.
As	=	Area of steel in tension, in square inches.
p	=	As/bd = Ratio of effective area of tension reinforcement to effective area of concrete.
b	=	Width of rectangular beam or width of flange of tee beam.
b′	=	Width of stem of tee beam.
d	=	Distance from the compression surface of the beam to the center of gravity of the steel reinforcement.
m	=	Distance from the center of steel reinforcement to the neutral axis.
N. A.	=	Neutral axis of the section.
k	=	Ratio of the depth of the neutral axis to the depth d.
j	=	Ratio of the lever arm of the resisting couple to depth d.
R	=	The constant which multiplied by bd^2 equals the resisting moment of the beam or section.
R. M.	=	The resisting moment of the beam or section in inch pounds.
. M.	=	The bending moment in inch pounds.

REINFORCED CONCRETE BEAM DESIGN

1. General

For the benefit of Architects and Engineers who desire to use Berloy Pressed Steel Cores, the following has been written.

This chapter is based on a collection of explanations of essential points relative to the design of reinforced concrete beams presented in simple form so that "he who runs may read."

It is assumed that those who design reinforced concrete beyond the use of tables for laying out floor panels, understand the general principles of structural engineering as applied to building construction.

RECTANGULAR BEAMS

2. Location of Neutral Axis

The following is based on the common theory of beams which assumes that the stress in compression or tension is proportioned to the distance from the neutral axis. The location of this neutral axis is determined by calculation based upon the tendency of the materials in question to stretch or compress under stress produced by the load. The ratio of this difference between the stretching or compressing of concrete and steel is known as the ratio of the modulus of elasticity of concrete to that of steel and usually taken as 1 to 15, which means that for a stress of one pound per square of cross section, steel will stretch or shorten 1/15th as much as an equal cross section of concrete. This same ratio is used with either medium or hard grade steel and 1-2-4 stone, gravel or slag concrete. If the safe stress on steel is taken at 16,000 pounds per square inch of section, then the stress on concrete to produce the same stretch or shortening would be 16,000÷15, or 1067 lbs. per square inch of section. See Figure No. 1.

If the concrete were safe for this stress of 1067 lbs. or the steel value only (650×15) 9750 lbs., the neutral axis would midway between the extreme fibre of the upper and lower flang just as it is in the ordinary wood or steel girders. This is beca the shortening or change of length of the upper flange or up effective section would be the same as any stretch or change length of the lower flange or lower effective section.

REINFORCED CONCRETE BEAM DESIGN

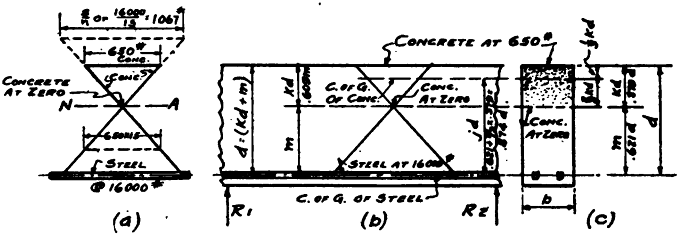


Figure No. 1

Based on C=650 Pounds and S=16000 Pounds and N = 15 Pounds

(A Stress Diagram)

3. Location of N. A. @ 650, 16000 and 15

Assuming concrete at 650 pounds and steel at 16,000 pounds per square inch and a ratio of 1 to 15, we find that for the neutral axis to be in the center, the concrete would have to equal 16000÷15 or 1067 pounds per square inch.

Since, however, the allowable stress on concrete is assumed to be 650 pounds per square inch of section, the concrete under this condition will not compress or shorten in the same proportion as the steel will stretch in the tension part of the beam. That is the compression of the concrete will be only $\frac{650}{1067}$ of the stretch in steel or say .609.

This at once fixes the location of the neutral axis for a composite beam, as it must under this condition be located so that the distance kd is .609 of the distance m, in which kd+m=d (see Fig. 1, in which all distances may be scaled), d being the distance from the upper surface of the beam to the center of the steel reinforcement. Only with the neutral axis so located, will the shortening or change of length above the neutral axis be .609 of the stretch or change below the neutral axis.

	If kd=.609m	and kd+m=d
then we have	.609m+m=d	or 1.609m=d
	or m=.621d	and kd=.379d.

herefore the distance to the neutral axis from the top of the beam, at the values 650, 1600 and 15 is .379d. This distance

REINFORCED CONCRETE BEAM DESIGN

may also be readily determined by the formula $\frac{1}{1+\frac{s}{cn}}$, see table giving "k" for different values page 288.

4. Effective Depth or jd

The effective depth of a beam is similar to that of a plate girder or any composite girder, and is the distance between the centers of gravity of the flanges.

The center of gravity of the lower flange is of course the c. of g. of the steel, and the center of gravity of the upper flange is the c. of g. of the effective section of concrete (or 1/3 of the distance kd from the top of the beam in rectangular sections).

This makes the effective depth, m plus 2/3 kd, or .6214d+ .2526d=.874d. The above effective depth is for the values assumed, see par. 3, but by substitution of any or all of the three values, i. e., steel in tension, concrete in compression, or the ratio of the modulus of elasticity, the effective depth can be determined for any values. This distance may also be readily determined by the formula, $jd = d - \frac{kd}{3}$. See table giving "j" for different values page 289.

5. Flange Stress

(a) The bending moment divided by the effective depth or distance between the centers of gravity of the flanges (as in the case of a plate girder or any other type of beam or girder) gives the flange stress.

(b) This stress divided by the tension value for steel, gives the square inches of steel required in the lower flange, and divided by the value in compression for concrete, gives the square inches required in the effective section of the concrete for the upper flange.

(c) But as the effectiveness of the concrete varies from zero at the neutral axis to its maximum value (extreme fibre stress) at the outer fibre, the lines of the triangle, having its point at the neutral axis, and its base at the outer fibre (as show in figure 1, (a) and (b)), will represent the effectiveness of the n-crete in compression.

(d) Unless the values of the two flanges are equal, t ns will have two moments of resistance, one determined by he concrete and one by the steel value, in which case the low of the two values will rule.

REINFORCED CONCRETE BEAM DESIGN

6. Width Required

The width b therefore, will be the width necessary to give the rectangular area above the neutral axis, which area, when multiplied by the average compressive value of the concrete, will equal the flange stress.

7. Reinforcing Steel

(a) By substituting values of concrete, steel, etc., and working out as per the formula given above, the decimal fraction can readily be established which indicates the effective depth for calculation of the section, and which fraction is usually between .86 and .90. There are many tables published which give these values, and they are given in this book on page 289.

Referring to tables which are based on n=15 and concrete at 650, with 16,000 pounds value for steel, this is .874 and with 18,000 pounds is .883. We can therefore, by summing up the above calculations, use the following formula for the determination of the quantity of steel required at the point of maximum B. M. to carry any loading on concrete beams or joists at these values.

$$@\ 16{,}000\ \text{lbs.,}\qquad \frac{\text{B. M.}}{.874 \times 16000 \times d} = \text{As.}$$

$$\text{or}\ @\ 18{,}000\ \text{lbs.,}\qquad \frac{\text{B. M.}}{.883 \times 18000 \times d} = \text{As.}$$

As = Area of steel required in square inches.

For all ordinary calculations, the fractional effective depth may be taken as .87, .875 or .88 with results close enough for all practical purposes.

You will note above the line the B. M. which should be in ...h pounds and below the line first appears the fractional effect... depth, and then the value of the steel being used in calcula...ı, and the last item being the depth of the beam from the ...ıpression face to the center of gravity of the reinforcing steel.

...he form above given is convenient in that the depth is the ...t item used, and can be varied in selecting a beam with ...ficient area of concrete to balance the area of reinforcing steel ...ıired as hereinafter described.

REINFORCED CONCRETE BEAM DESIGN

The resultant gives the number of square inches of steel tensile reinforcement required at the point of maximum moment.

(b) As the moment decreases from its maximum one or more rods can be dispensed with. They are usually bent up diagonally to assist in the resistance of the horizontal shear.

The bend is usually made at about the quarter point in uniformly loaded beams or beams with a centrally concentrated load. In other beams the point should be located by calculation, and the bend made a short distance beyond that point, so as to insure ample grip on the rod before it is actually needed.

8. Balanced Reinforcement

(a) Where the strength of a beam or girder is calculated by reversing the formula above noted and figuring the strength of the concrete in compression by its lever arm and supplying only the steel required to care for this maximum R. M., we have a beam or girder with the full quantity of steel which can be used under normal conditions. The percentage of steel to the entire area of concrete (bd) in rectangular beams, remains constant under the same ratio and values, and is known as the critical percentage of steel, or balanced reinforcement at which both steel and concrete are figured at full working value.

(b) See the following example. Assume a rectangular beam 25½″ wide with 13.125″ effective depth, and with concrete at 650 lbs., and steel at 16,000 lbs. per square inch.

The concrete above the N. A., constituting the upper flange of the beam, equals (13.125″ × .379) 4.974″ deep × 25½″ wide or 126.83 square inches in area, and this at a value of (650 lbs. ÷ 2) = 41,222 lbs., or the total value of the concrete compression flange.

This concrete value multiplied by the effective depth (41,222 lbs. × 11.47″) equals 427,816 inch pounds, and is the greatest R. M. possible with this section under balanced conditions at the values named.

For comparison let us reduce this R. M. to foot pounds r foot width of floor, thus, 472,816 ÷ (12″ × 2.12′) = 18,585 t pounds. Compare this with the R. M. in foot pounds per t width of floor given in the last column of floor core construc n load tables on page 360, which moment is given as 18,250 s. This was figured on Berloy floor core type of construction, u g the net concrete compression flange area.

REINFORCED CONCRETE BEAM DESIGN

Steel must be provided to reinforce the beam in tension, and by dividing the flange stress of 41,222 lbs. by the value of the steel in tension at 16,000 lbs. per square inch we find that 2.53 square inches of steel reinforcement will be required.

(c) The percentage of steel, usually noted as p, can be readily ascertained in rectangular beams by dividing the area of steel by the area of concrete (2.53 ÷ 328.1 inches) giving .0077 or a trifle over ¾ of 1% of steel. This decimal will also be found in published tables. Any rectangular beam with a smaller percentage of steel will not have its concrete overstressed and therefore the above calculation need not be made for such cases. This percentage p may be also readily determined by either of the following formula, $\left[\frac{x^2}{2\,(1-x)\,n}\right]$ or $\left[\frac{1}{2}\,\frac{C^2\,n}{s(s+Cn)}\right]$.

9. Value of Constant R

By making the calculation for a beam of unit size we can establish a constant by which we can quickly get the maximum R. M. of a rectangular beam of any size.

This constant, called R, based on the beam being of unit size, or one inch deep (to center of steel) and one inch wide, also on its being reinforced with the critical percentage of steel, and based on 16000, 650 and 15 is as follows: $b \times d^2 \times$ steel in tension $\times$ effective depth $\times$ critical percentage of steel, or $1 \times 1^2 \times 16000 \times .874 \times .0077 = 107.7$, which value can also be found in published tables. This constant may also be readily determined by the formula $R = Spj$. See table giving various values of constant "R," page 315.

By multiplying this value of R by the breadth of the beam and its depth squared we get the value of the maximum R. M. of any size rectangular beam.

CONTINUOUS BEAMS

1 Negative Moments

ι) Owing to the monolithic nature of construction ob-
t .ed by the use of concrete properly reinforced, advantage is
t ən of floor slabs and beams which are continuous, and they
a figured as W. L. over 9, 10 or 12 as per the conditions met.
] : result being as shown in Fig. No. 2, a cantilever type of

REINFORCED CONCRETE BEAM DESIGN

construction with a simple beam suspended between two cantilever beams over the supports.

(b) It is generally assumed in designing that the negative moment over the support is equal to ½ of the moment in the

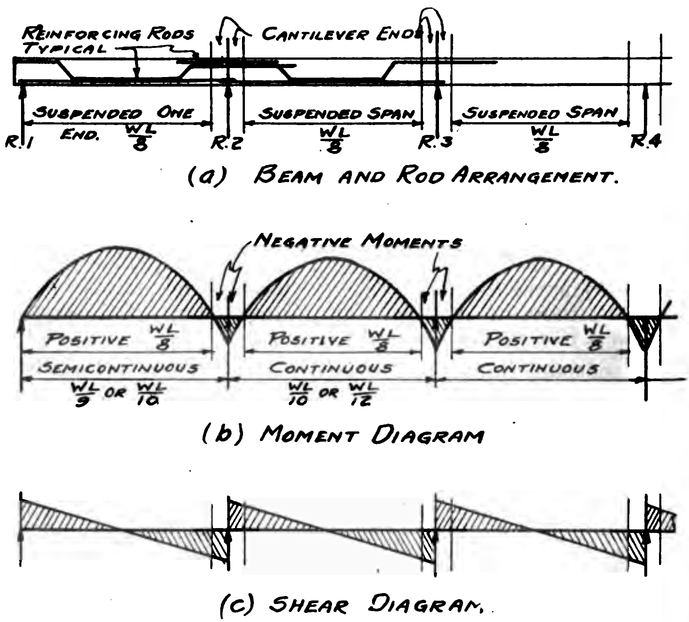


Figure No. 2
Continuous Beams

beam. The actual moment however can readily be ascertaine finding the length of a beam of the same size, with the same per foot with an equivalent moment in WL/8, and conside the ends as cantilever beams.

(c) The rods which are bent up and extend over the sup and into the adjoining beam or joist, usually are designed tc tend to the quarter point of the same. Some regulations,

REINFORCED CONCRETE BEAM DESIGN

ever, are based upon their extending far enough beyond the support to develop in that distance, the full strength of the rod, through the adhesion of the concrete.

Drawing No. 2 shows bending moment and shear diagrams of semi-continuous and continuous beams.

(d) The fraction of the length of spans figured as continuous, giving an equivalent moment in WL/8, as shown above, is approximately as follows:

WL/9=.9428, WL/10=.894, WL/12=.8165. See Fig. 2 (a) and (b).

(e) In continuous beams the extreme fibre stress on concrete in compression for the negative moment may be increased 15% in value adjacent to the supports (at bottom of beam). If, however, with this increased value of concrete in compression for the negative moment, there is a shortage of concrete area in the bottom of joists, tapered cores, increasing the width of the joists may be used. See par. 18.

11. Double Reinforced Beams

The value of steel used in compression to assist the concrete, in the compression flange of a reinforced concrete beam is determined by its location in reference to the N. A. of the beam. A new calculation to establish the N. A. in cases where steel is used to assist the concrete compression flange of the beam will develop the fact that the N. A. is lowered slightly, because the average value of the compression flange will be increased. As applied in practice however (the change in location being very small), it is usual to base the calculation for the added steel on the location of the N. A. already determined for the concrete. See par. 2.

Its value can therefore be taken as the value of the concrete at the point at which the rods are placed, multiplied by the elasticity ratio. For example, if the extreme fibre stress of 650 lbs. is b ıg used for concrete and the elasticity ratio as 15, with the s :l located 2/3 of the distance from the neutral axis to the e: reme fibre or top of the beam, its value would be 2/3×650× 1 ɔr 6375 lbs. per square inch and steel at this value multiplied b the effective depth of the beam will give the added resisting n nent.

iş customary to place this steel with its center of gravity a 2 inches from the compression face of the beam.

REINFORCED CONCRETE BEAM DESIGN

The rods should be of sufficient length for the bond value (on both sides) to equal the maximum compressive stress in the steel.

The rods should be accurately located and well anchored to the body of the beam with stirrups.

As this is not economical construction it is generally used only in special cases.

TEE SECTIONS

12. Solid Slab and Beam Type

In the general type of floor known as slab and beam construction where beams are 3 feet or more on centers, the rectangular beam formula applies very closely and the area of steel can be determined in the same way and by the method described for rectangular beams.

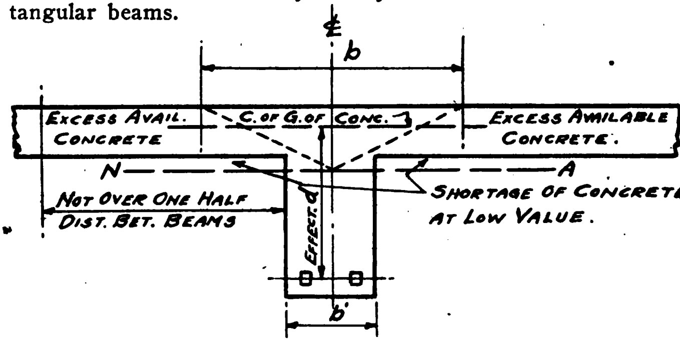


Figure No. 3

The working out of a diagram as shown (Fig. 3) of a condition in which the N. A. is slightly below the bottom of the slab, will show a lack of concrete just above the N. A. but of concrete of very low value and which shortage is more than compensated for by the excess width of slab or plate available which is of concrete of a much higher value.

13. Slab with Fillers

In the type of construction in which Berloy pressed s el cores or tile fillers are used, where the concrete joists are spa d at from 14 to 31 inches on centers, the maximum load carry g capacities should be worked out from the value of the conc e in compression, based on the areas of concrete available at t ir average values, multiplied by the effective depth of the sect 1. This principle of calculation also applies to concrete beams r girders of any shape.

REINFORCED CONCRETE BEAM DESIGN

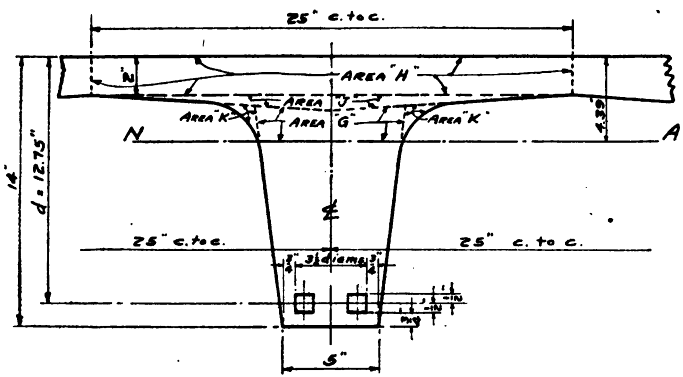


Figure No. 4

14. Calculation of Berloy Tee Section

Calculation of maximum resisting moment of the Berloy type of core construction, with 12-inch deep 20-inch wide core, with 5-inch joist and 2 inches of concrete over the same. Based on steel value of 16,000 lbs. and concrete at 650 lbs. per square inch, and area of steel at 2 square inches. See figure 4.

The depth from the top of the concrete to the center of the steel reinforcement (based on the use of 1-inch bars) will be $(12''+2'')-(\frac{3}{4}''+\frac{1}{2}'')=12.75''$ or d.

The ratio $p=2\div(25\times12.75)=.006$.

The value of j at the above ratio=.885, therefore $12.75''\times.885=11.28$ or jd.

Location of the neutral axis from the top=$12.75\times.344$ or 4.39 inches. The value of the concrete compression flange is deter-ned by a summation of the value of the units shown in figure multiplied by the effective depth of the beam or jd, as follows:

ea G

$3''\times2.08''=16.64$ square inches.

Concrete value$=\frac{1.04}{4.39}\times650$ lbs. or 154 lbs. per sq. in.

total=2560 lbs.

REINFORCED CONCRETE BEAM DESIGN

Area K (Brought forward) 2560 lbs.

2.2"×.5"×2=2.2 square inches.

Concrete value$=\frac{1.71}{4.39}\times 650$ lbs. or 253 lbs. per sq. in.

total=537 lbs.

Area J

25"×.375"=9.375 square inches.

Concrete value$=\frac{2.015}{4.39}\times 650$ lbs. or 298 lbs. per sq. in.

total=2794 lbs.

Area H

25"×2"=50 square inches.

Concrete value$=\frac{3.39}{4.39}\times 650$ lbs. or 502 lbs. per sq. in.

total=25100 lbs.

Total of all=31011 lbs.

The resisting moment of the beam based on the concrete therefore is 31,011 lbs. × 11.28 inches or 349,800 inch pounds.

Our published tables for this section indicate a B. M. of 14,400 foot pounds per foot wide. This changed to inch pounds and for a total section 25 inches wide to compare with the above figure is as follows: 14,400 lbs.×12"×2.08'=359,424 inch pounds, or the two results differ only about 3 per cent.

The tables have been worked up on the basis of the ratio of steel to an assumed rectangular beam of the width of the slab and the depth d, as follows: b=25", d=12.75 or an assumed area of 318.75 square inches, the ratio of steel equaling .006, in which case j=.885 and jd=11.28" and the resisting moment based on the area of steel equals 2"×16,000 lbs.×11.28" or 360,960 inch pounds, or to be exact only 3.22 per cent above the method based on the common theory of beams previously described.

If less care had been taken to determine the real ratio p as the basis for the selection of the values of j and k, and the value j been assumed as .874 (based on the critical percentage with steel at 16,000 and concrete at 650 lbs. per square inch) the result of the calculation would have been 355,000 inch lbs. R. M., or only 1¼ per cent above the more accurate method based on the common theory of beams.

It is therefore evident that for usual conditions, the selection of any value of j from .87 to .88 for general use as suggested in

REINFORCED CONCRETE BEAM DESIGN

paragraph 7-a will give results of much greater accuracy than will present day construction methods.

15. Percentage of Reinforcement

The usual practice in tee beams or joists is not to exceed 2½ to 3% of steel reinforcement in the tension flange based on the area of the concrete joist (exclusive of the tee wings or flanges), without investigation under the governing conditions.

The percentage in the above case is about 2.5%, and as the shear is not excessive, and the width is sufficient for the rods used, this percentage may be considered safe in this case.

16. Width of Stem and Concrete Protection

(a) The width of the stem or web of tee joists or beams is regulated by one of two conditions.

(b) One being the shearing value of the section, based on the combined shearing value of the concrete and steel and usually limited to a value of 120 lbs. per square inch where concrete is reinforced with bent rods and stirrups; or 60 lbs. per square inch where concrete is reinforced with bent rods only; or 40 lbs. per square inch on concrete without stirrups or bent rods, in the cross sectional area of the beam exclusive of the tee wings or flanges if any.

(c) The other being the proper spacing of rods to develop the bond value so that the rods cannot slip, added to the necessary thickness of concrete covering to the reinforcement for fireproofing, etc.

(d) This type of construction being considered as slab construction with fillers, and as being further protected by a plastered ceiling under the same, is usually designed to have ¾ inch of concrete protection below and at the sides of the rods and nearly all standard regulations call for rods or bars to be spaced 2½ diameters center to center.

Thus the width where two rods are placed side by side should be 3½ times the diameter of the rod plus 2×¾″ of protecting c crete.

ublished tables call for the above noted joist to be 5 inches v and as per above, 3½×1+1½″=5 inches width required, s he requirements as to width of joist are satisfied.

) All other types of beam and girders require 1½ to 2 inches c oncrete protection outside of the rods added to the proper s ing between rods as per regulations under which design is b made.

REINFORCED CONCRETE BEAM DESIGN

17. Girder Bars

A principle practiced in general slab and beam construction where reinforced concrete girders carry reinforced concrete beams, is, that the portion of the floor slab acting as flange to the girder should be reinforced with bars near the top, at right angles to the girder to enable it to transmit local loads directly to the girder on the principle of a cantilever and not through the beam, thus avoiding an integration of compressive stresses due to simultaneous action as floor slab and girder flange.

These bars are not generally used in the core type of construction unless the beam supporting the joists is of long span and heavily loaded. One-half inch round rods 3 to 4 feet long should be used, spaced about 12 inches on centers in ordinary beam and slab construction, and one rod in each section of slab between joists in joist construction when used.

18. Tapered Cores

(a) Cores tapered in width are designed for the purpose of widening the joists adjacent to the bearings, as follows:

(1) When the shearing stress per square inch on the regular section is excessive, see Par. 16 (b).

(2) When it is desired to keep the shearing stress low enough to obviate the necessity of using stirrups, see Par. 16 (b).

(3) Where the concrete in compression in the regular section at the point of maximum negative moment is overstressed, see Par. 10 (e).

(b) Cores may also be tapered in height when it is desired to use them adjacent to a cross beam or girder of tee section for the purpose of supplying sufficient concrete in the compression flange.

It is generally assumed that the design is safe if the lowest point of the top of the tapered core does not extend inside of the triangle previously described as representing the effective section of the concrete, even though this point may be slightly above the location of the N. A.

19. Approximate Formula for Tee Beams

When tables are not available and where time cannot be taken for more accurate calculation, the following formula often called the plate girder formula will be found convenient, and

REINFORCED CONCRETE BEAM DESIGN

will usually give approximately correct results for reinforcement required.

For steel, $As=\frac{B.M.}{sd'}$.

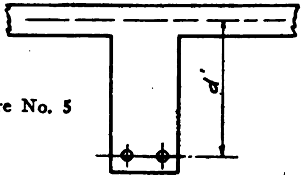


Figure No. 5

As=The Area of steel reinforcement required in square inches.

B. M.=The Bending Moment in inch pounds.

d′=The distance from the center of action of the steel reinforcement to the center of the plate or slab.

s=Tensile value of the reinforcing steel.

By which formula, assuming a concrete section similar to that just figured, i. e.: 14 inches deep over all, with 5-inch wide beam and 2-inch thick plate or slab, this approximate effective depth equals 14″—(1″ from top of beam to center of slab + ¾″ concrete protection under the rod and ½″ to center of rod) or 11.75 inches.

The steel value at this depth on the 16,000-lb. basis will equal 188,000 lbs. per square inch.

Reference to the former calculation shows an effective depth of 11.28 inches and a steel value of 180,480 lbs. per square inch.

The difference in the steel value is only about 4%, which difference is so small that the formula is practically correct in this case.

Special care should be used in applying this approximate formula where the joists or beams are spaced close together, as the compression stresses in the concrete may be exceeded and the design be unsafe.

SHEAR AND BOND STRESSES

20. General Illustration

(a) Thousands of beams have been designed and erected in which the simple rules hereinafter noted for caring for shear and bond stresses have been applied and have proven entirely ade[illegible]te.

REINFORCED CONCRETE BEAM DESIGN

(b) The steel in the tension flange and the concrete in the compression flange, resist the tendency to bend under loading, having their values multiplied by the length of the lever arm, see Par. 5. It is evident therefore, that the concrete between the neutral axis and the steel reinforcement must transmit the tensile stress from the steel to the concrete in compression above the neutral axis.

(c) The stresses under consideration are those being transmitted from one flange to the other, and proper provision for these stresses is essential to the development of the strength of the beam.

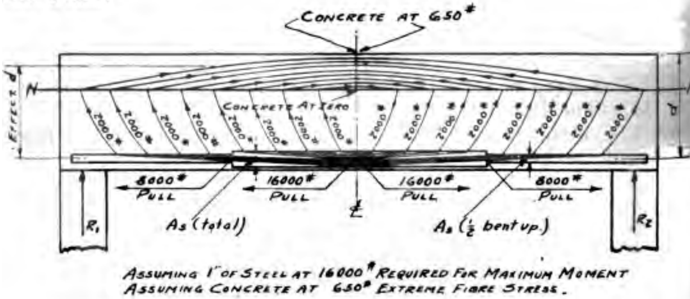


Figure No. 6

(d) Figure 6 illustrates the lines of the principle stresses in reinforced concrete beams, based on a single concentrated load in the center (neglecting the dead weight of the beam). These lines represent stresses (said to cross or meet at the N. A.). A stress diagram of this condition will show that the B. M. decreases uniformly from maximum at the center to zero at the support and that the shear (and therefore the bond stress) is the same in intensity at all points in the beam. The above drawing is intended to illustrate the transmission of the stresses, based on the condition described; but it must be borne in mind that the question is not thoroughly understood, thus accounting for the many theories advanced.

(e) The total bond stresses as well as the total horizontal shearing stress per lineal inch of beam between the support and the point of zero shear, must equal the maximum flange stress as all stress within the beam produced by the load must be absorbed and transmitted to materials of opposite functions by which the stress is finally resisted.

REINFORCED CONCRETE BEAM DESIGN

We can hereby trace the load through the lines of resistance within the beam or slab, to the reaction and from there through the columns to the foundation where it is carried by the bearing upon which the entire building rests.

21. Vertical Shear

(a) The vertical shearing stress at any point in a simple beam is equal to the reaction minus the loads occurring between the reaction and the point in consideration.

(b) This is resisted by the cross sectional area of the concrete in the beam (exclusive of the tee wings or flanges if any) and the shearing value of the straight reinforcing rods in the lower part of the beam. The shearing value of the concrete if reinforced with bent rods is usually taken as 60 lbs. per square inch or 40 lbs. per square inch on concrete without stirrups or bent rods. Steel in shear in reinforced concrete is usually taken as 10,000 lbs. per square inch.

(c) The usual practice is to allow 120 lbs. per square inch for the combined shearing value on the cross sectional area of the concrete, where it is reinforced with bent rods and stirrups. See Par. 16 (b).

(d) There are cases in which short spans and heavy loads cause the amount of reinforcing steel to be regulated by the shearing rather than the bending moment requirements. Concrete brackets under the ends of beams can also be figured in vertical shear, but the question of the cost of more complicated form work, etc., should be duly considered.

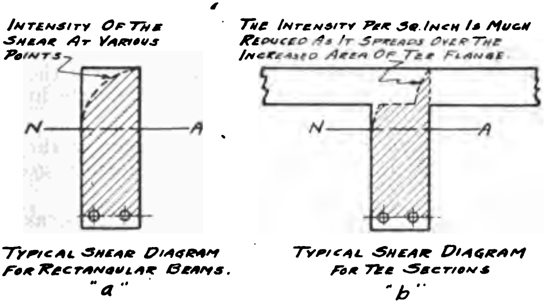


Figure No. 7

REINFORCED CONCRETE BEAM DESIGN

22. Horizontal Shear

(a) Horizontal shear as herein considered may be simply described by noting the condition existing where two or more planks are laid over an opening, one on top of the other, without securing them together. The result being that upon application of sufficient load they will slide on each other, as well as bend.

By computing the value required, in nails or dowels, to secure them together to make them act as one piece of timber, we shall for all practical purposes be calculating the horizontal shear.

(b) The tendency of one part or layer of concrete to slide on the adjoining layers is resisted by the concrete itself as well as by the steel stirrups and bent up reinforcing rods, at the values noted in Par. 21 (b) and (c) on vertical shear.

(c) The shearing resistance of the steel rods, as with nails or dowels, extends beyond the actual point of its contact with the concrete, and the resistance of either stirrups or bent up rods is generally permitted to be figured in calculation as extending over a distance in the length of the beam not exceeding ¾ of its depth, in that portion of the beam where the web stresses exceed the allowable value of concrete alone in shear.

(d) The horizontal shearing stress is herein taken as equal per any lineal inch of beam (thus resolving it into thin layers like planks for the purposes of calculation) to the vertical shear divided by the effective depth of the beam at that place, and as before noted the summation of the same equals the maximum flange stress. See Par. 20 (e).

(e) The horizontal shearing stress in the beam remains constant in intensity from the reinforcing steel to the neutral axis, and decreases in intensity above the neutral axis (as the ordinates of a parabola) as they are absorbed by the concrete in compression, **Fig. 7.**

(f) It is good practice to use stirrups, even if they a[illegible] not apparently or theoretically required, as they form a good b[illegible]der or tie for the concrete.

(g) In figuring stirrups for estimating purposes, assum[illegible] one stirrup per foot of length of beam or joist, or for a typical b[illegible]ilding job on addition of 7% of the weight of the reinforcing [illegible]eel in joists, beams and girders for stirrups will be found very [illegible]ose to the actual requirement.

REINFORCED CONCRETE BEAM DESIGN

23. Bond Stress

(a) The steel reinforcement in the bottom of the beam is designed to be stressed to its full tensile value at the point of maximum moment, which stress decreases until it becomes zero.

(b) This stress on the rod must be transmitted to the opposite or compression flange of the beam, either by anchoring the rod or rods at the end of the beam or absorbed and transmitted by the adhesion of the concrete.

(c) "Anchored Bars." Anchorage by nuts and washers is seldom used, but rods are frequently bent at the ends as an extra precaution. The paragraph under the heading of "Use of Anchored Bars," page 217, 2nd edition of "Principles of Reinforced Concrete Construction" by Turneaure & Maurer, describes the effect of these arrangements for anchoring the rods.

24. Adhesion of Concrete

(a) The total adhesion of the concrete to the surface of the reinforcing steel must equal the maximum stress in the steel.

(b) The adhesion or bond value required per lineal inch of beams is the same in amount as the change in tensile stress in the steel for the same inch, which change in stress is equal to the horizontal shear per lineal inch of beam at the same place.

(c) Various regulations give 80 lbs. as the bond value per square inch on the surface of plain rods, but many times it is hard to get proper bond at this value, so it is preferable to use deformed bars of an approved type which will easily give 150 lbs. working stress with an ample margin of safety.

(d) It is seldom necessary to calculate the adhesion value unless plain bars are used and the shear is high on the cross sectional area of the concrete beam, exclusive of the tee wings or flanges if any.

(e) In case of necessity bond value can be increased by using smaller reinforcing rods, thereby increasing the surface area of th steel, and with closely spaced bent up rods and stirrups at the er of a beam, the bond value on the rods can be safely incr ised 25% over the values before given.

25 Bond and Shear Stresses in Continuous Beams

.) A joist of given size, length and load carrying capacity requires different quantities of reinforcement in the lower fla ge for various conditions designed for, which changes the ar nt of bond stress thereon, while the total bond and shearing

REINFORCED CONCRETE BEAM DESIGN

stresses (which are equal per any lineal inch of beam, Par. 20 (e)) are the same in all cases.

(b) In the case of beams figured as continuous the bond stress is on the bottom rod in the portion of the beam having the positive moment, and on the top rods at the ends of the beam where the negative moment is shown, see Par. 10 (d) and Fig. 2 (a) and (b), and is in amount at any point, equal to the horizontal shear at the same place. See Fig. 8.

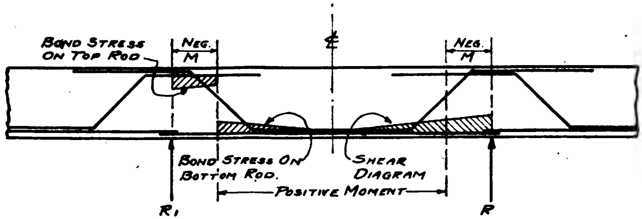


Figure No. 8

ECONOMY IN DESIGN

26. Rectangular Beams and Slabs

(a) Reference to the following data taken from the tables giving various fractional dimensions and values for design, page 315, will give information from which comparisons can be made, and it will be seen that conservative values of steel and concrete should be selected, both as to following good practice and for maximum economy.

(b) In a great many buildings the tee beam type of construction predominates, and it should be noted that the same principles do not necessarily apply in securing maximum economy in these, as apply where rectangular beams or where only slabs are used.

(c) In rectangular beams and slabs the values of concrete and steel selected, giving the higher value of the constant R, prove the more economical, because the higher the value of R, the greater the resisting moment of any beam or section of slab of given size, see Par. 9.

(d) Slabs are designed as rectangular beams in sections one foot wide, and the steel reinforcement required therefor is distributed throughout this width. The rods are usually not spaced further apart than the depth of the slab.

REINFORCED CONCRETE BEAM DESIGN

27. Tee Beams

In tee section design the full available width of the tee flange or slab is rarely ever needed, in which cases the maximum resisting moment is not limited by the value of the concrete, as is the case with the constant R, which also calls for the critical percentage of steel to be used therewith. Par. 8.

In tee beams we usually have, for the purposes of design, an excessive quantity of concrete in the upper flange, and the smaller the quantity of steel we can use with it, the greater the economy. Therefore in tee beams the combination giving the greatest effective depth to the beam or joist, and thereby the greatest value to the steel, will prove the more economical, see Par. 13.

The type of construction particularly referred to in this chapter is wholly tee section, the plate or slab acting as the compression member, but the joists are spaced so closely together that the plate or slab arches from one joist to the next one without typical slab reinforcement.

28. Comparative Tables

In structures wherein the beams are spaced further apart and reinforced slabs used between them, both of the above described types of construction are in use, the slab being of rectangular design and the beams of tee design.

For rectangular beam based on elasticity ratio n @ 15.

Steel @ 16,000	Concrete @ 500	R = 71.2
Steel @ 16,000	Concrete @ 650	R = 107.5
Steel @ 16,000	Concrete @ 700	R = 120
Steel @ 16,000	Concrete @ 750	R = 133.8
Steel @ 16,000	Concrete @ 800	R = 146.7
Steel @ 18,000	Concrete @ 500	R = 66
Steel @ 18,000	Concrete @ 650	R = 100.3
Steel @ 18,000	Concrete @ 700	R = 113
Steel @ 18,000	Concrete @ 750	R = 125.6
Steel @ 18,000	Concrete @ 800	R = 138.9

For tee beams, also based on elasticity ratio n @ 15.

Steel @ 16,000	Concrete @ 500	Effective Depth .894 and 1″	Steel @ 1″ d = 14304 lbs.
Steel @ 16,000	Concrete @ 650	Effective Depth .874 and 1″	Steel @ 1″ d = 13984 lbs.
Steel @ 16,000	Concrete @ 700	Effective Depth .868 and 1″	Steel @ 1″ d = 13888 lbs.
Steel @ 16,000	Concrete @ 750	Effective Depth .862 and 1″	Steel @ 1″ d = 13792 lbs.
Steel @ 16,000	Concrete @ 800	Effective Depth .857 and 1″	Steel @ 1″ d = 13712 lbs.
Steel @ 18,000	Concrete @ 500	Effective Depth .902 and 1″	Steel @ 1″ d = 16236 lbs.
Steel @ 18,000	Concrete @ 650	Effective Depth .883 and 1″	Steel @ 1″ d = 15894 lbs.
Steel @ 18,000	Concrete @ 700	Effective Depth .877 and 1″	Steel @ 1″ d = 15786 lbs.
Steel @ 18,000	Concrete @ 750	Effective Depth .872 and 1″	Steel @ 1″ d = 15696 lbs.
Steel @ 18,000	Concrete @ 800	Effective Depth .867 and 1″	Steel @ 1″ d = 15606 lbs.

BERLOY FLOOR CORES

DESCRIPTIVE DATA

AND

LOAD TABLES

BERLOY FLOOR CORES

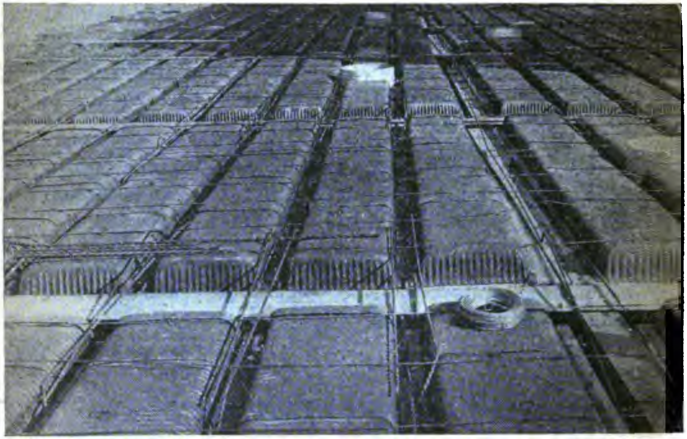
The Berloy floor-core type of reinforced concrete floor construction consisting of a series of parallel connected T-beams, has come into extensive use and is recognized as a standard form of fire-resistive floor and roof construction.

The Berloy pressed steel floor-cores provide the most economical and practical means for the coring or cutting out of the unnecessary concrete below the neutral axis in long span floor and roof construction.

The resultant structure is of sufficient depth to permit maximum economy in the reinforcing steel requirement and avoid undue deflection.

ıe system provides a simple, light weight, economical type of re :orced concrete construction which may be supported by w 's, structural steel, or reinforced concrete beams. The concr : floor or roof construction may be poured in connection wi ı the reinforced concrete forming the structural beams, or the co -ete fireproofing for steel beams.

BERLOY FLOOR CORES



Floor Cores and reinforcing steel in place ready for pouring of concrete. Note the large pipe sleeves for casting openings in the floor. With this construction, vent openings, elevator wells, etc., can be provided for easily. The space beneath the cores offers a convenient passageway for pipes, wires, etc.

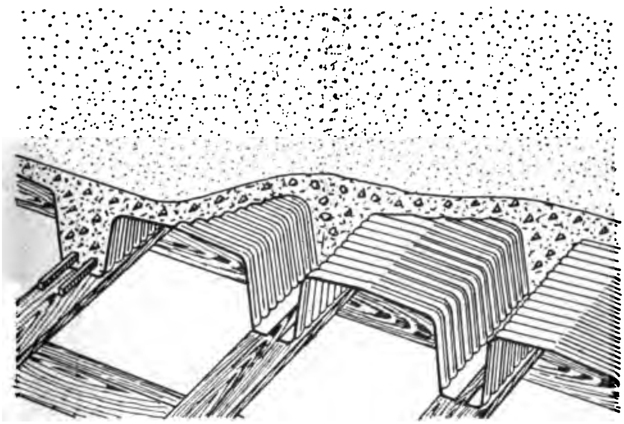
DESCRIPTION OF FLOOR CORE DETAILS

The various features that go to make up the system are as follows:

T-Beams.—The floor structure is in reality a series of connected T-beams presenting a flat surface on top. The flange, usually from 2 to 3 inches thick, forms the compression member of the T-section, and the web or rib of the tee, which encases the reinforcing steel, projects below the slab. These ribs are from 4 to 6½ inches in width, generally spaced from 24 to 31½ inches on centers. The cores range from 4 to 14 inches in depth.

Ceilings.—In the great majority of cases a metal lath cei g is secured to the bottom of the joists, which upon being plast d produces a flat ceiling surface. There is, however, a tende y toward extensive use of the construction in buildings for fact y or storage purposes, which are necessarily designed for he y loads, and where the flat ceilings are not required. In th e cases the cores are removed, and upon removal a concrete c l- ing with a surface similar in appearance to a wood joist flo is produced.

BERLOY FLOOR CORES



Cross section of Removable Floor Cores.

Special Features.—The special feature in the core type of construction is in the use of a broad trough-shaped pressed steel core, placed in an inverted position, and supported by a wood skeleton centering. These pressed steel cores form the centering for the sides of the rib and the bottom of the flange while the wooden supports form the centering for the bottom of the rib of the T-beam. The cores are varied in design and weight to meet requirements of either permanent or removable centering. Removable cores are usually made in 22-gauge and non-removable in 26-gauge material. Where necessary the cores are tapered in width to increase the width of rib adjacent to supports to make proper provision for the maximum shearing stresses or for requirements of negative bending moment. Suitable end caps are provided to close up the ends of the lines of cores.

BERLOY FLOOR CORES

Tapered cores (above view) can be furnished for use where shear is excessive. Standard taper is 2 inches from horizontal on top of core and 2 inches on each leg from parallel. This makes the small end of the core 2 inches less in depth and 4 inches less in width.

Dimensions.—The dimensions of the cores are approximately as follows: Stock lengths 2 feet 6 inches and 3 feet. Regular widths, 20 inches and 25 inches, with special widths of 6, 8, or 12 inches and over, made for narrow spaces. Depths 4, 6, 8, 10, 12, and 14 inches.

Shape of Cores.—The cores are made with sides slightly tapered and usually with a slight arch in the top.

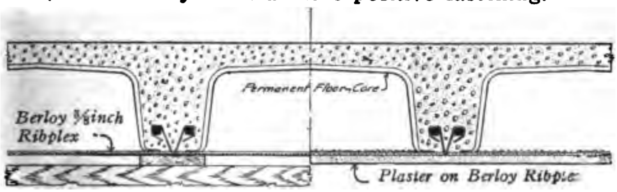
Joist Spacing.—It may be readily seen from the data g en above that the skeleton wood centering to support the cores nd form the bottom of the rib will require horizontal suppor ng members only 6 or 8 inches wide and spaced 24 to 31½ in es on centers, insuring great economy in material and labor, as ell as speed in erection of the carpenter work.

BERLOY FLOOR CORES

METHODS OF CONSTRUCTION

There are two general methods of construction differing principally in the installation of the metal lath ceiling under the cores.

One method is where Ribplex Metal Lath or a stiff heavy gauge diamond mesh lath is laid over the forms before the cores are placed. The concrete when poured engages the meshes of the lath in the bottom of the ribs, thereby securing it in position. It is generally found advisable, however, to secure wire to the lath, which wire is placed so as to extend up into the concrete rib, and thereby form a more positive fastening.



Permanent Cores—Metal Lath laid on forms before setting Floor Cores, and wired to reinforcing bars before pouring concrete.

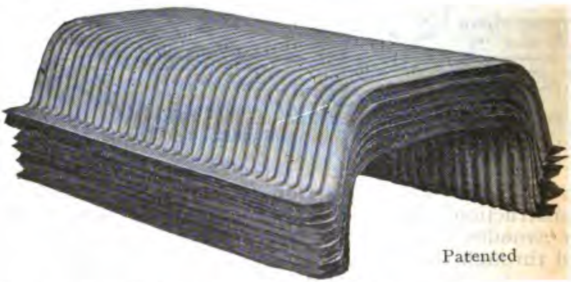
The other method provides for a metal lath ceiling to be installed after the wood centering has been removed from under the construction. The cores are secured by lightly nailing them to the wooden forms, wire hangers with hook ends are then pushed through the holes previously punched in the tops or sides of the cores, and when concrete is poured these hook ends are securely held by it. After the concrete is poured and the centering removed, furring rods are suspended under and at right angles to the ribs by securing them by means of the hanger wires. The metal lath is then wired to the furring rods in the usual manner, or ⅜-inch Ribplex is used in which case no furring rods are required. Advantages are claimed for this method in that the ceiling plaster is kept away from the concrete, thus allowing an air space above the entire plastered ceiling. This eliminates discoloration of the white coat, which discoloration is usually in evidence where any type of joist construction is used which does not provide continuous air space. A further advantage of this method is that the cores can be removed for re-use.

ADVANTAGES OF CORE CONSTRUCTION

Among the decided advantages for this pressed-steel floor core construction are the following:

BERLOY FLOOR CORES

(1) Forty-five to 60 per cent saving in bulk of concrete over that required in slab construction of same depth; (2) saving in reinforcing steel in the floor by reason of light weight of concrete and core; (3) saving effected in entire structure, including beams, girders, columns, and foundations of the building by reason of small dead weight of floors; (4) weight of cores only 1/30 as much as terra-cotta tile fillers for equal covering area; (5) bulk of cores only 1/40 as much as terra-cotta tile fillers; (6) one core covers four times as much area of floor as one terra-cotta tile; (7) the forms produce tight centering, and eliminate waste of concrete; (8) small masses of concrete are used, thus reducing the immense quantities of moisture incident to larger masses of concrete, the drying out of which interferes with the heating of buildings during the first winter season.



54 Berloy Steel Floor Cores ready for shipment. This quantity is sufficient to build 325 square feet of floor area.

Straight and fixed alignment of joists are obtained by lightly nailing the pressed-steel cores in position, which alignment is necessary to develop the strength of the structure.

The danger of extensive damage by failure from defective material or workmanship is remote, as the floor consists of small units. Therefore, no large areas or excessive loads are dependent upon any one unit.

DETAILS OF DESIGN

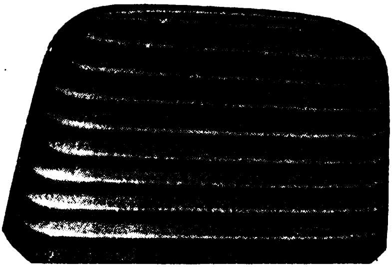
Refinement.—An inspection of the details of design shows it to be ideal from an engineering standpoint as all parts can be properly proportioned as to stress and fireproofing requirements. This refinement of design eliminates the excess material us· ˙ and

BERLOY FLOOR CORES

the unnecessary weight imposed on the entire structure by other types of construction. The main structural parts of the building can also be fireproofed with the greatest ease in connection with the installation of the concrete work in the floors. The system provides for the design of concrete construction with a minimum quantity of concrete which adequately cares for the shearing and bond stresses as well as protection from fire to the reinforcing steel.

Depth.—The depth of the construction is determined by economical design of the concrete and reinforcing steel, or by the requirement as to ceiling heights. The flanges are usually designed as 2, 2½, or 3 in. thick, making the total thickness of the floor structure range from 6 to 17 in. to which, of course, must be added the thickness of plastered ceiling and floor fill, if any be required, and floor finish.

The steel end cap used with Berloy Floor Cores



Concrete Frame.—When the floor-core construction is supported by concrete beams, economical design is also accomplished. In this case the ends of the cores are set back from the web or rib of the beam any distance to provide proper width of flange to develop the required compression in the beam. This upper compression flange will probably be of ample depth in that it includes the depth of both the rib and the flange over the core.

Application of Formulas.—While the regular principles of design of reinforced concrete apply to this system of construction, owing to the thin and narrow slab and departure from straight lines in outline, the application of the usual T-beam formulas does not do justice to the section. One way to design quickly and within safe lines will be to work up a table of maximum resisting moments, based on the upper concrete compression flange

BERLOY FLOOR CORES

value. These calculations can be readily made by applying the common theory of beams, which assumes that the stress in compression or tension is proportionate to the distance from the neutral axis. From this calculation we can ascertain the greatest amount of reinforcing steel which can be used without overstressing the concrete for various depths and widths of cores. Having thus established the maximum value of the T-section we can proceed to design this type of construction by the usual rectangular beam formulas, with but the one restriction, i. e., that we must not exceed in steel requirement the maximum allowable area previously determined. General rules by empirical formula as to proportion of stem to flange should not be construed to rule in this type of construction, the only requirement being that we keep within the limits above outlined.

SPECIFICATIONS FOR FIREPROOF FLOORS

General.

The floor and roof construction shall be reinforced concrete. This construction shall consist of rows of Berloy Steel Floor Cores separated by reinforced concrete joists covered with concrete to the thickness shown on the plan, and of a metal lath ceiling installed with the construction which is to be plastered afterwards. Complete detail drawings showing the size, location and arrangement of all the concrete and steel must be submitted to the Architect for approval. The reinforced concrete shall be so designed that the stresses in pounds per square inch shall not exceed the following:

Extreme fibre stress of concrete in compression	lbs.
Shearing stress in concrete when the diagonal tension is resisted by steel	lbs.
Shearing stress in concrete when the diagonal tension is not resisted by steel	lbs.
Bond stress between concrete and deformed bars	lbs.
Tensile stress in steel reinforcement	lbs.

The room floors shall be designed for a live load of .... ›s. per square foot, and the corridors .... lbs. per square ɔt. The construction shall be installed by a competent superinten- nt, foremen and workmen.

Steel Cores and Metal Lath.

Berloy Steel Cores shall be manufactured by The Berger ːg. Co., Canton, Ohio, from 26 gauge corrugated steel she or

BERLOY FLOOR CORES

equal. The End Caps shall be 28 gauge metal. Metal Lath to be 28 gauge ⅜-inch Ribplex Lath or equal.

Reinforcing Steel.

Steel for the reinforcement of concrete shall conform with the requirement of the specifications of the American Society of Testing Materials.

Installation of Permanent Cores

Lay Ribplex (with ribs at right angles to joists, with ribs up and lapping the ends) on the wood skeleton centering. Place the first row of Berloy Steel Cores of the size and length called for on the detail drawing. Secure them to the forms by nailing. Then place the next row of Cores the exact distance from the first row so that a joist shall be formed of the width called for on the plan. Cores must be placed true to line. On both ends of each row of cores place an end cap. Then place the main reinforcing steel so that it will be ¾ inch from the bottom of the joist. The Ribplex is to be tied securely to the reinforcing bars. On the top of the Cores and at right angle to the joist place ¼-inch round rods 20 inches on centers. Where slabs are continuous over supports continuity bars are to be provided and where slabs are not continuous anchor bars are to be provided. These bars which are to be placed in the top of the slab are to be of the size and shape indicated on the plans or called for in the specifications.

Concrete Materials.

All Portland Cement shall meet the requirements of the Standard Specifications of the American Society for Testing Materials. The fine aggregate (sand) shall be clean; well graded from coarse to fine and free from soil, loam and other deleterious matter. If sand is too fine, it is to be mixed with an equal part of stone screening. The coarse aggregate (broken stone or gravel) shall clean, hard, sound, free from deleterious matter, and of such e as to pass through a three-quarter inch ring.

xing and Placing Concrete.

All concrete for slabs, joists and beams shall be proportioned one part of Portland Cement, two parts of fine aggregate and r parts of coarse aggregate, except columns which shall have -1½-3 mix. These proportions shall be maintained at all

BERLOY FLOOR CORES

times. The various materials shall be thoroughly mixed until the concrete is uniform throughout. The water shall be free from oil, acids, strong alkalies or vegetable matter. The mixture shall be wet enough so that it will flow when agitated, but not so wet as to cause separation of materials. The concrete shall be deposited immediately after mixing; any concrete showing a partial set before placing shall be removed.

Reinforcing steel shall be placed in accordance with the plans, and shall not be disturbed in placing the concrete. Concrete shall be puddled and agitated with suitable tools so as to completely surround the reinforcing steel, thoroughly fill the forms and prevent all voids and honeycombing. Concrete for the joists and over the tops of the cores must be poured at the same time and concreting must proceed continuously. If concreting must be stopped, great care must be taken to stop the work at such a point as not to weaken the construction in any way. Concreting shall be stopped over the center of cores and parallel to joists. Concrete in beams shall be placed so as to be perfectly monolithic with the adjacent construction. After pouring a floor it shall be left undisturbed until the concrete has thoroughly set. All columns are to be filled at least three hours ahead of the floor construction to allow the concrete in the columns to set properly. The filling of the columns must be in one continuous operation to the level of the bottom of the girder supported by it. In pouring columns, the concrete is to be well stirred with a long pole to prevent voids and honeycombing.

Centering and Forms.

All forms must be strong and stiff, true to line, practically unyielding and sufficiently tight to hold the liquid concrete without leakage. Forms for Berloy Core Construction may consist of boards under the joists only. All forms for beams, girders, and lintels shall be so designed that at least one side may be removed without disturbing the bottom portion of the forms and its support. All posts supporting forms for slabs, beams and girders must rest upon wedges which may be loosened or removed without producing undue stress in the floor system. shavings, chips, sawdust and other foreign matter shall be moved before the concrete is placed in the forms.

Centering shall not be removed until the concrete is th oughly set and has attained practically its full strength. No fa work shall be removed without the approval of the Architect Engineer in charge. Before removing supports of beams : girders, at least one side of the girder forms shall be remove

BERLOY FLOOR CORES

order to determine the soundness and hardness of the concrete. Beams and girders, under favorable conditions, shall remain supported for at least two weeks after all other false work has been removed. After forms are removed, temporary posts shall be placed under the floor until it has thoroughly set.

Freezing Weather.

Placing concrete in freezing weather shall be avoided whenever possible, but when necessary, sufficient precautions shall be taken to prevent the concrete from freezing, such as heating with salamanders, covering the concrete with sawdust, straw, etc., and heating the materials. All concrete that is frozen shall be removed. Centering shall not be removed until the concrete has thoroughly set and attained its full strength.

Removable Type of Cores.

When it is desired to reuse the Berloy Floor Cores, they shall be made of 22 gauge sheets and be of the removable type, with holes punched in the top or sides through which wires are inserted, and which are held in place while the concrete sets.

These wires are afterwards used to secure the Ribplex ceiling lath which is not installed until after the forms are removed.

The centering work is to be so designed that cores may be removed before bottom centering under the beams is taken down.

When the cores are removed they are to be cleaned and properly prepared for reuse.

After the forms are removed ⅜-inch Berloy Ribplex ceiling lath is secured in place by the wires installed for that purpose.

Suspended Ceiling.

When ceilings under the Floor-core construction are to be suspended below the joists, No. 7 gauge galvanized hanger wires with hooked ends are to be dropped through holes in the cores, the hook ends to engage in the concrete when it is poured. These nger wires are to be dropped at about 24-inch centers in both ections to support ¾-inch 16 gauge Berloy cold rolled "C" annels which are to be spaced at about 24-inch centers and ich are to run at right angles to the joists.

To these channels securely fasten the 28 gauge ⅜-inch Berloy ibplex with 16 gauge galvanized wire, by tying each rib of e Ribplex to each channel. The ribs of the Ribplex are to be ainst, and the mesh away from the channel supports.

BERLOY FLOOR CORES

TABLES

We have prepared for this book a complete series of tables, which give the load carrying capacities per square foot for constructions involving 4-6-8-10-12 and 14-inch cores with concrete slabs over the cores, 2-2½-3 and 4 inches in depth.

The tables include varying areas of reinforcing steel, based on steel not exceeding 16,000 and 18,000 lbs. per square inch in tension, with corresponding values of concrete not exceeding 650 lbs. per square inch in compression. The reinforcing steel is assumed to be deformed bars.

There are also tables giving details of core standards, average floor weights, quantities of concrete involved under various conditions, etc.

LOAD TABLES

The load tables are made up on the basis of WL/10, and steel areas are selected as closely as possible to furnish the necessary reinforcement for similar loads based on WL/8, WL/9 and WL/12.

The **loads** tabulated are total loads per square foot and therefore include the following:

Slab and joist weight, floor finish (including sleeper fill if any), weight of ceiling and live load.

The **weights** noted in the tables include only the slab and joist concrete. The weight of the floor finish and ceiling depend upon the details of construction. The balance of the tabulated load indicates the live load.

The R. M. in ft. lbs. is for section of floor one foot wide.

The design of the joists is based on the use of two bars per joist so that one may be bent up if desired, and on ¾-inch concrete protection under and at the sides of the bars, with the bars spaced at not less than 2½ diameters center to center.

No loads are tabulated which produce more than 120 lbs. per square inch shear based on the average area of the conc[illegible] joist, nor in excess of 150 lbs. per square inch bond stress.

The heavy line indicates where the shear passes 60 lbs. [illegible] square inch on the concrete area above noted.

Temperature rods, either ¼-inch or ⅜-inch round, should [illegible] inserted in the slab or plate in the usual manner to pre[illegible] cracks.

BERLOY FLOOR CORES

The load tables are in series as follows:
4-6-8-10-12 and 14 inch cores with
2-2½-3 and 4-inch concrete slab or plate:
Based on maximum values of steel and concrete at 16,000 and 650 lbs. per square inch ($n = 15$)..Pages 350 to 373
Followed by a series as above with maximum values of steel at 18,000 and concrete at 650 lbs. per square inch ($n = 15$) ....Pages 374 to 397
Forty-eight tables in all.
The following general tables are also included:
Floor cores required for various spans ....Page 330
Standard Core details ....Pages 331 to 333
General data 4 to 14-inch cores ....Pages 334 to 336
Average thickness of concrete, cores and solid slab ....Pages 337 to 348
Data on reinforcing bars ....Page 349

FLOOR CORES, WEIGHTS AND CODE WORDS

	Wt. in lbs. per 100 lin. feet	2′ 6″	3′ 0″
4 inch Cores, 26 gauge....	175	zevur	zeyso
6 inch Cores, 26 gauge....	198	zevys	zeyut
8 inch Cores, 26 gauge....	219	zewan	zeyvy
10 inch Cores, 26 gauge....	242	zewep	zezer
12 inch Cores, 26 gauge....	267	zewna	zezre
14 inch Cores, 26 gauge....	290	zewor	zezto
4 inch Cores, 22 gauge....	291	zewpe	zezuv
6 inch Cores, 22 gauge....	330	zewro	zezwy
8 inch Cores, 22 gauge....	365	zewty	ziacy
10 inch Cores, 22 gauge....	403	zewus	ziadz
12 inch Cores, 22 gauge....	445	zewyt	ziahd
14 inch Cores, 22 gauge....	483	zeyap	ziajf
4 inch Cores, 20 gauge....	353	zeygd	ziank
6 inch Cores, 20 gauge....	403	zeyir	ziarn
8 inch Cores, 20 gauge....	448	zeylj	ziasp
10 inch Cores, 20 gauge....	495	zeymk	ziaws
inch Cores, 20 gauge....	548	zeyos	ziaxt
inch Cores, 20 gauge....	594	zeypa	zibbo
inch End Caps, 28 gauge	63 per 100 pcs.	zibiz	
inch End Caps, 28 gauge	81 " " "	zibob	
inch End Caps, 28 gauge	100 " " "	zibuc	
inch End Caps, 28 gauge	119 " " "	zibwa	
inch End Caps, 28 gauge	139 " " "	zibye	
inch End Caps, 28 gauge	158 " " "	zicay	

BERLOY FLOOR CORES

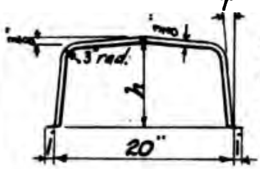
FLOOR CORES REQUIRED FOR VARIOUS SPANS

Span	Cores Required		Span	Cores Required	
	2′ 6″ long	3′ 0″ long		2′ 6″ long	3′ 0″ long
8′	2	1	19′	4	3
8′ 6″	1	2	19′ 6″	3	4
9′		3	20′	2	5
9′ 6″	4		20′ 6″	1	6
10′	4		21′		7
10′ 6″	3	1	21′ 6″	5	3
11′	2	2	22′	4	4
11′ 6″	1	3	22′ 6″	3	5
12′		4	23′	2	[illegible]
12′ 6″	5		23′ 6″	1	[illegible]
13′	4	1	24′		8
13′ 6″	3	2	24′ 6″	5	4
14′	2	3	25′	4	5
14′ 6″	1	4	25′ 6″	3	6
15′		5	26′	2	7
15′ 6″	5	1	26′ 6″	1	8
16′	4	2	27′		9
16′ 6″	3	3	27′ 6″	5	5
17′	2	4	28′	4	6
17′ 6″	1	5	28′ 6″	3	[illegible]
18′		6	29′	2	
18′ 6″	5	2	29′ 6″	1	
			30′		1

BERLOY FLOOR CORES

FLOOR CORE STANDARDS—Sheet A

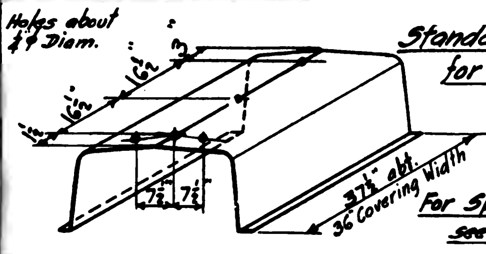
Standard 20" Berloy Corrugated Cores.



Depth of Corrugations = 3/8"
Rise of Crown in Center = 3/8"
Radius of Corner Curve = 3"
Height, to center of corr. = h

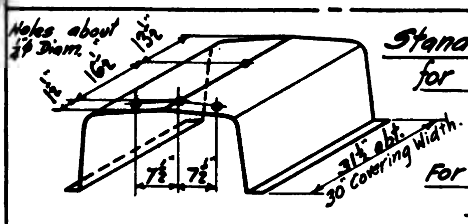
h = 4, 6, 8, 10, 12, & 14 Inches
Length = 2'-6" & 3'-0"

Made in 20, 22, & 26 Ga. { 26 Ga. Std. Permanent. 22 " " Removable. 20 " Special.



Standard Punching for 3'-0" Cores.

For Special Punching see Sheet B



Standard Punching for 2'-6" Cores.

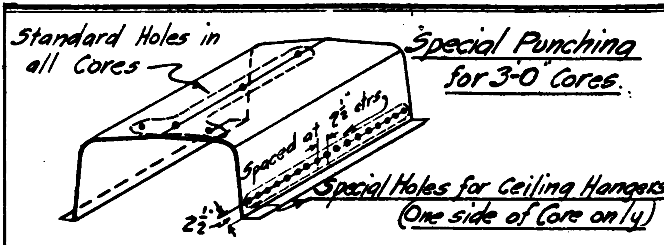
For Special Punching see Sheet B

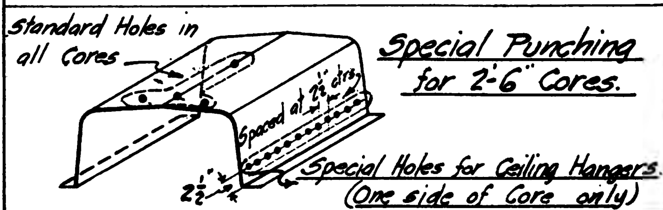
Special Punching shown on Sheet B
End Caps & Tapered Cores on Sheet C

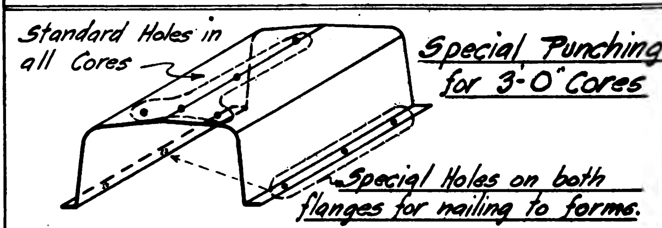
BERLOY FLOOR CORES

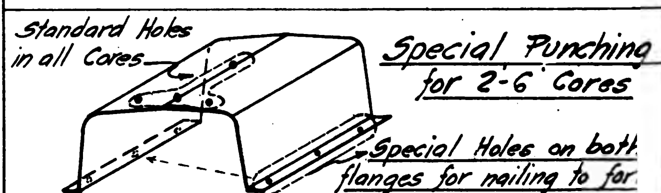
FLOOR CORE STANDARDS—Sheet B

Special Punching of Holes; For Cost See Price List









For Details of Standard Cores see Sheet

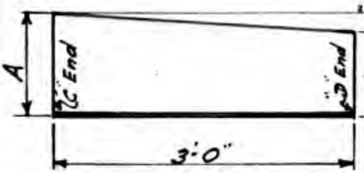
End Caps & Tapered Cores on Sheet C

BERLOY FLOOR CORES

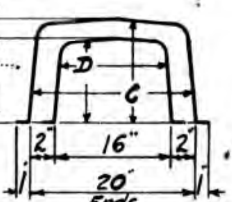
FLOOR CORE STANDARDS—Sheet C

Details of Tapered Cores and Details of End Caps

STANDARD TAPERED-CORES



Side View.



Ends

Dimensions, 16" at narrow & 20" for wide end are constant.

Size	6	8	10	12	14
Dimension A	6	8	10	12	14
Dimension B	4	6	8	10.	12

These Tapered-Cores furnished in 20, 22, & 26 Gauge material. Details of section and Standard Punching as shown on Sheet A.
Made only in 3'-0" lengths. Can be punched Special as shown on Sheet B.

END CAPS

Furnished in 28 Ga. only. They are designed to remain in place permanently, even tho removable cores are used. All orders assumed to be for Caps for Regular Cores, unless specially noted as for Tapered-Cores.

For Details of Standard Cores see Sheet A
For Details of Special Punching see Sheet B

BERLOY FLOOR CORES

CORRUGATED STEEL FLOOR CORES

4" CORE DATA

+ Conc.	Joists	4"	4½"	5"	5½"	6"	6½"
	Width	4"	4½"	5"	5½"	6"	6½"
	Center to Center	24"	24½"	25"	25½"	26"	26½"
2 inch	Average Wt. per sq. ft	37.9	38.6	39.3	39.9	40.5	41.2
2 inch	Cu. ft. Conc. per sq. ft.	.257	.262	.266	.271	.275	.280
2 inch	Core Area %	48.6	47.6	46.6	45.7	44.8	44.
2½ in.	Average Wt. per sq. ft.	43.9	44.5	45.2	45.9	46.5	47.1
2½ in.	Cu. ft. Conc. per sq. ft.	.298	.303	.308	.313	.317	.322
2½ in.	Core Area %	44.8	43.9	43.1	42.3	41.4	40.6
3 inch	Average Wt. per sq. ft.	49.9	50.6	51.2	51.9	52.5	53.1
3 inch	Cu. ft. Conc. per sq. ft.	.340	.345	.350	.355	.359	.363
3 inch	Core Area %	41.6	40.8	40.0	39.2	38.5	37.7
4 inch	Average Wt. per sq. ft.	61.9	62.5	63.3	63.9	64.5	65.1
4 inch	Cu. ft. Conc. per sq. ft.	.423	.428	.433	.438	.443	.447
4 inch	Core Area %	36.4	35.7	35.0	34.3	33.6	33.0

6" CORE DATA

+ Conc.	Joists	4"	4½"	5"	5½"	6"	6½"
	Width	4"	4½"	5"	5½"	6"	6½"
	Center to Center	24"	24½"	25"	25½"	26"	26½"
2 inch	Average Wt. per sq. ft.	43.9	44.8	45.9	46.9	47.9	48.9
2 inch	Cu. ft. Conc. per sq. ft.	.298	.304	.312	.319	.326	.334
2 inch	Core Area %	55.4	54.2	53.2	52.1	51.1	50.1
2½ in.	Average Wt. per sq. ft.	49.9	50.9	51.9	52.9	53.9	54.9
2½ in.	Cu. ft. Conc. per sq. ft.	.34	.348	.353	.361	.368	.374
2½ in.	Core Area %	52.1	51.1	50.	49.	48.2	47.2
3 inch	Average Wt. per sq. ft.	55.9	57.0	57.9	58.9	59.9	[illegible]
3 inch	Cu. ft. Conc. per sq. ft.	.381	.388	.395	.403	.410	[illegible]
3 inch	Core Area %	49.2	48.2	47.2	46.3	45.3	[illegible]
4 inch	Average Wt. per sq. ft.	67.9	68.9	69.9	70.9	71.9	[illegible]
4 inch	Cu. ft. Conc. per sq. ft.	.464	.473	.478	.485	.493	[illegible]
4 inch	Core Area %	44.3	43.3	42.5	41.7	40.8	[illegible]

BERLOY FLOOR CORES

CORRUGATED STEEL FLOOR CORES

8″ CORE DATA

+Conc.	Joists	4″	4½″	5″	5½″	6″	6½″
	Width	4″	4½″	5″	5½″	6″	6½″
	Center to Center	24″	24½″	25″	25½″	26″	26½″
2 inch	Average Wt. per sq. ft.	50.1	51.5	52.9	54.2	55.5	56.7
	Cu. ft. Conc. per sq. ft.	.34	.35	.36	.37	.379	.387
	Core Area %	59.2	58.	56.9	55.7	54.6	53.6
2½ in.	Average Wt. per sq. ft.	56.1	57.5	58.9	60.2	61.5	62.7
	Cu. ft. Conc. per sq. ft.	.382	.392	.401	.411	.420	.428
	Core Area %	56.3	55.3	54.1	53.0	52.0	51.1
3 inch	Average Wt. per sq. ft.	62.1	63.5	64.9	66.2	67.5	68.7
	Cu. ft. Conc. per sq. ft.	.424	.433	.443	.452	.462	.470
	Core Area %	53.8	52.7	51.6	50.7	49.7	48.7
4 inch	Average Wt. per sq. ft.	74.1	75.5	76.9	78.2	79.5	80.7
	Cu. ft. Conc. per sq. ft.	.507	.516	.527	.535	.545	.554
	Core Area %	49.3	48.3	47.4	46.4	45.5	44.7

10″ CORE DATA

+Conc.	Joists	4″	4½″	5″	5½″	6″	6½″
	Width	4″	4½″	5″	5½″	6″	6½″
	Center to Center	24″	24½″	25″	25½″	26″	26½″
2 inch	Average Wt. per sq. ft.	56.7	58.5	60.2	61.8	63.4	64.9
	Cu. ft. Conc. per sq. ft.	.385	.397	.41	.421	.432	.443
	Core Area %	61.5	60.2	59.0	57.9	56.7	55.6
2½ in.	Average Wt. per sq. ft.	62.7	64.5	66.2	67.8	69.4	70.9
	Cu. ft. Conc. per sq. ft.	.427	.439	.45	.463	.475	.485
	Core Area %	59.0	57.8	56.7	55.5	54.5	53.4
3 inch	Average Wt. per sq. ft.	68.7	70.5	72.2	73.8	75.4	76.9
	Cu. ft. Conc. per sq. ft.	.469	.481	.493	.504	.515	.525
	Core Area %	56.7	55.6	54.5	53.4	52.4	51.4
4 inch	Average Wt. per sq. ft.	80.7	82.5	84.2	85.8	87.4	88.9
	Cu. ft. Conc. per sq. ft.	.552	.564	.575	.588	.599	.610
	Core Area %	52.7	51.6	50.6	49.6	48.7	47.7

BERLOY FLOOR CORES

CORRUGATED STEEL FLOOR CORES

12″ CORE DATA

+ Conc.	Joists	4″	4½″	5″	5½″	6″	6½″
	Width	4″	4½″	5″	5½″	6″	6½″
	Center to Center	24″	24½″	25″	25½″	26″	26½″
2 inch	Average Wt. per sq. ft.	64.	66.2	68.2	70.2	72.	73.8
	Cu. ft. Conc. per sq. ft.	.435	.450	.465	.479	.491	.504
	Core Area %	62.6	61.4	60.2	59.	57.8	56.8
2½ in.	Average Wt. per sq. ft.	70.	72.2	74.2	76.2	78.	79.8
	Cu. ft. Conc. per sq. ft.	.476	.491	.505	.52	.533	.546
	Core Area %	60.5	59.3	58.1	57.0	55.9	54.8
3 inch	Average Wt. per sq. ft.	76.	78.2	80.2	82.2	84.	85.8
	Cu. ft. Conc. per sq. ft.	.519	.533	.547	.561	.575	.586
	Core Area %	58.5	57.3	56.2	55.	54.	53.0
4 inch	Average Wt. per sq. ft.	88.	90.2	92.2	94.2	96.	97.8
	Cu. ft. Conc. per sq. ft.	.603	.615	.63	.645	.658	.671
	Core Area %	54.8	53.7	52.7	51.5	50.6	49.7

14″ CORE DATA

+ Conc.	Joists	4″	4½″	5″	5½″	6″	6½″
	Width	4″	4½″	5″	5½″	6″	6½″
	Center to Center	24″	24½″	25″	25½″	26″	26½″
2 inch	Average Wt. per sq. ft.	71.8	74.2	76.6	78.8	81.	83.1
	Cu. ft. Conc. per sq. ft.	.488	.505	.522	.537	.553	.567
	Core Area %	63.4	62.	60.9	59.7	58.6	57.4
2½ in.	Average Wt. per sq. ft.	77.8	80.2	82.6	84.8	87.	89.1
	Cu. ft. Conc. per sq. ft.	.53	.546	.563	.579	.595	.609
	Core Area %	61.5	60.2	59.	57.8	56.7	55.7
3 inch	Average Wt. per sq. ft.	83.8	86.2	88.6	90.8	93.	[illegible]
	Cu. ft. Conc. per sq. ft.	.571	.588	.605	.62	.635	[illegible]
	Core Area %	59.7	58.4	57.3	56.3	55.1	[illegible]
4 inch	Average Wt. per sq. ft.	95.8	98.2	100.6	102.8	105.	[illegible]
	Cu. ft. Conc. per sq. ft.	.656	.672	.688	.704	.72	[illegible]
	Core Area %	56.3	55.3	54.2	53.	52.	[illegible]

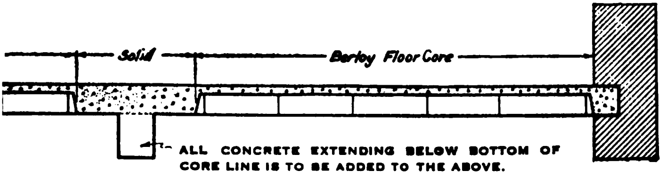
BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Per-cent-age	AVERAGE THICKNESS OF SLAB IN FT.					
	4 + 2	6 + 2		8 + 2		
	24″o.c.	24″ o. c.	24½″o.c.	24″ o. c.	24½″o.c.	25″ o. c.
60	.354	.446	.449	.537	.543	.549
62	.349	.438	.442	.527	.533	.540
64	.344	.430	.434	.517	.524	.530
66	.340	.423	.427	.507	.514	.521
68	.335	.416	.420	.498	.504	.511
70	.330	.408	.413	.488	.495	.502
72	.325	.401	.405	.478	.485	.492
74	.320	.394	.398	.468	.475	.483
76	.315	.386	.391	.458	.466	.473
78	.310	.379	.384	.448	.456	.464
80	.305	.372	.376	.438	.446	.455
82	.301	.364	.369	.429	.437	.445
84	.296	.357	.362	.419	.427	.436
86	.291	.349	.355	.409	.417	.426
88	.286	.342	.347	.399	.408	.417
90	.281	.335	.340	.389	.398	.407
92	.276	.327	.333	.379	.388	.398
94	.272	.320	.326	.369	.379	.388
96	.267	.313	.318	.360	.369	.379
98	.262	.305	.311	.350	.359	.369
100	.257	.298	.304	.340	.350	.360

Percentage column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.



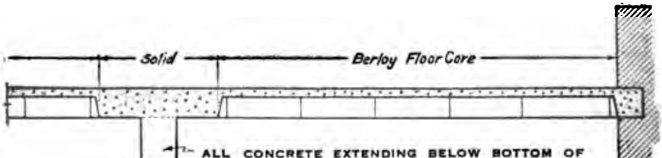
BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Per-cent-age	AVERAGE THICKNESS OF SLAB IN FT.						
	10 + 2			12 + 2			
	24″o.c.	24½″o.c.	25″o.c.	24″o.c.	24½″o.c.	25″o.c.	25½″o.c.
60	.631	.638	.646	.728	.737	.746	.754
62	.619	.626	.634	.713	.723	.732	.740
64	.606	.614	.622	.699	.708	.718	.726
66	.594	.602	.610	.684	.694	.704	.713
68	.582	.590	.599	.669	.679	.690	.699
70	.569	.578	.587	.655	.665	.676	.685
72	.557	.566	.575	.640	.651	.662	.671
74	.545	.554	.563	.626	.636	.648	.658
76	.533	.542	.552	.611	.622	.634	.644
78	.520	.530	.540	.596	.608	.620	.630
80	.508	.518	.528	.582	.593	.606	.617
82	.496	.506	.516	.567	.579	.592	.603
84	.483	.494	.504	.552	.565	.577	.589
86	.471	.481	.492	.537	.550	.563	.575
88	.459	.469	.481	.523	.536	.549	.561
90	.447	.457	.469	.508	.522	.535	.548
92	.434	.445	.457	.494	.507	.521	.534
94	.422	.433	.445	.479	.493	.507	.520
96	.410	.421	.433	.464	.478	.493	.506
98	.397	.409	.422	.450	.464	.479	.493
100	.385	.397	.410	.435	.450	.465	.479

Percentage Column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.



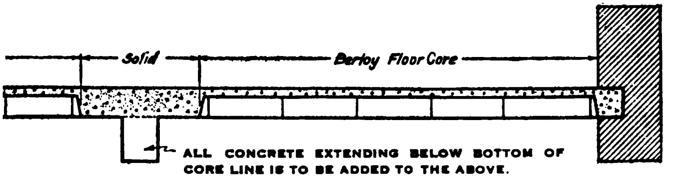
BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Per-cent-age	AVERAGE THICKNESS OF SLAB IN FT.						
	14 + 2						
	24″o.c.	24½″o.c.	25″o.c.	25½″o.c.	26″o.c.		
60	.826	.836	.846	.856	.865		
62	.809	.820	.830	.840	.849		
64	.792	.803	.814	.824	.834		
66	.775	.787	.798	.808	.819		
68	.758	.770	.782	.793	.803		
70	.741	.753	.765	.777	.787		
72	.725	.737	.749	.761	.772		
74	.708	.720	.733	.745	.756		
76	.691	.704	.717	.729	.740		
78	.674	.687	.700	.713	.725		
80	.657	.671	.684	.697	.709		
82	.640	.654	.668	.681	.694		
84	.623	.637	.652	.665	.678		
86	.606	.621	.636	.649	.662		
88	.589	.604	.619	.633	.647		
90	.573	.588	.603	.617	.631		
92	.556	.571	.587	.601	.615		
94	.539	.555	.571	.585	.600		
96	.522	.538	.555	.569	.584		
98	.505	.522	.538	.553	.569		
100	.488	.505	.522	.537	.553		

Percentage Column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.



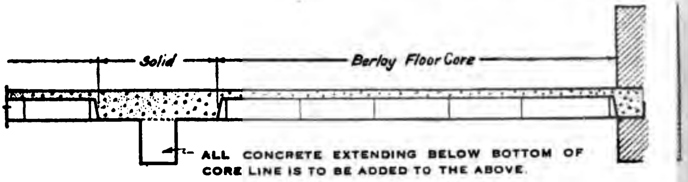
BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Per-cent-age	AVERAGE THICKNESS OF SLAB IN FT.						
	4 + 2½		6 + 2½		8 + 2½		
	24″o.c.	24½″o.c.	24″o.c.	24½″o.c.	24″o.c.	24½″o.c.	25″o.c.
60	.396	.399	.487	.492	.579	.585	.591
62	.391	.394	.480	.485	.569	.575	.581
64	.386	.390	.472	.478	.559	.566	.572
66	.381	.385	.465	.470	.549	.556	.562
68	.376	.380	.458	.463	.540	.546	.553
70	.371	.375	.450	.456	.530	.537	.543
72	.367	.370	.443	.449	.520	.527	.534
74	.362	.366	.436	.442	.510	.517	.524
76	.357	.361	.428	.434	.500	.508	.515
78	.352	.356	.421	.427	.490	.498	.505
80	.347	.351	.414	.420	.480	.488	.496
82	.342	.346	.406	.413	.470	.479	.486
84	.337	.341	.399	.406	.461	.469	.477
86	.332	.337	.391	.398	.451	.459	.467
88	.327	.332	.384	.391	.441	.450	.458
90	.322	.327	.377	.384	.431	.440	.448
92	.318	.322	.369	.377	.421	.430	.439
94	.313	.317	.362	.370	.411	.421	.429
96	.308	.313	.355	.362	.401	.411	.420
98	.303	.308	.347	.355	.392	.402	.410
100	.298	.303	.340	.348	.382	.392	.401

Percentage Column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.



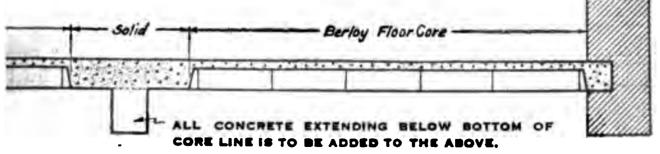
BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Percentage	AVERAGE THICKNESS OF SLAB IN FT.						
	10 + 2½			12 + 2½			
	24″o.c.	24½″o.c.	25″o.c.	24″o.c.	24½″o.c.	25″o.c.	25½″o.c.
60	.673	.680	.687	.769	.778	.786	.795
62	.661	.668	.675	.754	.764	.772	.781
64	.648	.656	.663	.740	.749	.758	.767
66	.636	.644	.651	.725	.735	.744	.754
68	.624	.632	.640	.710	.721	.730	.740
70	.611	.620	.628	.696	.706	.716	.726
72	.599	.608	.616	.681	.692	.702	.712
74	.587	.596	.604	.666	.678	.688	.699
76	.575	.584	.592	.652	.663	.673	.685
78	.562	.572	.580	.637	.649	.659	.671
80	.550	.559	.568	.622	.634	.645	.657
82	.538	.547	.557	.608	.620	.631	.644
84	.525	.535	.545	.593	.606	.617	.630
86	.513	.523	.533	.578	.591	.603	.616
88	.501	.511	.521	.564	.577	.589	.602
90	.488	.499	.509	.549	.563	.575	.589
92	.476	.487	.497	.535	.548	.561	.575
94	.464	.475	.485	.520	.534	.547	.561
96	.451	.463	.474	.505	.520	.533	.547
98	.439	.451	.462	.491	.505	.519	.534
100	.427	.439	.450	.476	.491	.505	.520

Percentage Column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.



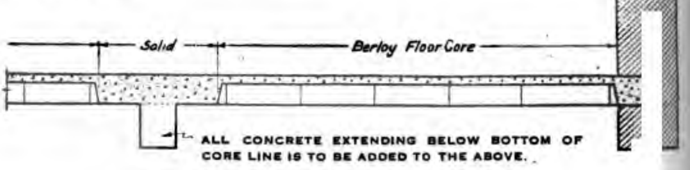
BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Per-cent-age	AVERAGE THICKNESS OF SLAB IN FT. 14 + 2½						
	24"o.c.	24½"o.c.	25"o.c.	25½"o.c.	26"o.c.		
60	.868	.878	.888	.897	.907		
62	.851	.861	.872	.881	.891		
64	.834	.845	.856	.865	.876		
66	.817	.828	.839	.849	.860		
68	.800	.812	.823	.833	.845		
70	.783	.795	.807	.817	.829		
72	.767	.779	.790	.801	.813		
74	.750	.762	.774	.786	.798		
76	.733	.745	.758	.770	.782		
78	.716	.729	.742	.754	.767		
80	.699	.712	.726	.738	.751		
82	.682	.696	.709	.722	.735		
84	.665	.679	.693	.706	.720		
86	.648	.662	.677	.690	.704		
88	.631	.646	.660	.674	.688		
90	.615	.629	.644	.659	.673		
92	.597	.612	.628	.643	.657		
94	.581	.596	.612	.627	.642		
96	.564	.579	.595	.611	.626		
98	.547	.563	.579	.595	.610		
100	.530	.546	.563	.579	.595		

Percentage Column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.



BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Percentage	AVERAGE THICKNESS OF SLAB IN FT.						
	4 + 3		6 + 3		8 + 3		
	24"o.c.	24½"o.c.	24"o.c.	24½"o.c.	24"o.c.	24½"o.c.	25"o.c.
60	.437	.440	.529	.533	.621	.627	.633
62	.432	.435	.522	.526	.611	.617	.623
64	.427	.430	.514	.518	.601	.607	.614
66	.422	.426	.507	.511	.591	.598	.604
68	.418	.421	.499	.504	.582	.588	.595
70	.413	.416	.492	.497	.572	.578	.585
72	.408	.411	.485	.489	.562	.569	.576
74	.403	.407	.477	.482	.552	.559	.566
76	.398	.402	.470	.475	.542	.549	.557
78	.393	.397	.462	.468	.532	.540	.547
80	.388	.393	.455	.460	.522	.530	.538
82	.384	.388	.448	.453	.513	.520	.528
84	.379	.383	.440	.446	.503	.511	.519
86	.374	.378	.433	.439	.493	.501	.509
88	.369	.374	.425	.431	.483	.491	.500
90	.364	.369	.418	.424	.473	.481	.490
92	.359	.364	.410	.417	.463	.472	.481
94	.354	.359	.403	.410	.453	.462	.471
96	.350	.355	.396	.402	.444	.452	.462
98	.345	.350	.388	.395	.434	.443	.452
100	.340	.345	.381	.388	.424	.433	.443

Percentage Column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.

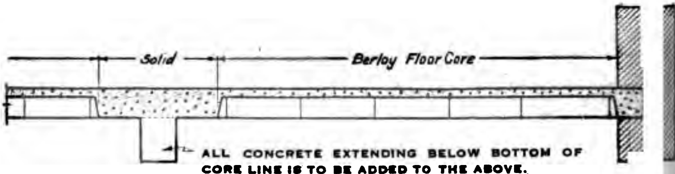
BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Per-cent-age	AVERAGE THICKNESS OF SLAB IN FT.						
	10 + 3			12 + 3			
	24"o.c.	24½"o.c.	25"o.c.	24"o.c.	24½"o.c.	25"o.c.	25½"o.c.
60	.715	.722	.729	.811	.820	.828	.837
62	.702	.710	.717	.796	.805	.814	.823
64	.690	.698	.705	.781	.791	.800	.809
66	.678	.686	.693	.767	.777	.786	.795
68	.666	.674	.682	.752	.762	.772	.782
70	.653	.662	.670	.738	.748	.758	.768
72	.641	.650	.658	.723	.734	.744	.754
74	.629	.638	.646	.709	.719	.730	.740
76	.617	.626	.635	.694	.705	.715	.726
78	.604	.614	.623	.680	.691	.701	.713
80	.592	.602	.611	.665	.676	.687	.699
82	.580	.589	.599	.650	.662	.673	.685
84	.567	.577	.587	.636	.648	.659	.671
86	.555	.565	.575	.621	.633	.645	.657
88	.543	.553	.564	.606	.619	.631	.644
90	.530	.541	.552	.592	.605	.617	.630
92	.518	.529	.540	.577	.590	.603	.616
94	.506	.517	.528	.563	.576	.589	.602
96	.493	.505	.516	.548	.562	.575	.588
98	.481	.493	.505	.533	.547	.561	.575
100	.469	.481	.493	.519	.533	.547	.561

Percentage Column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.



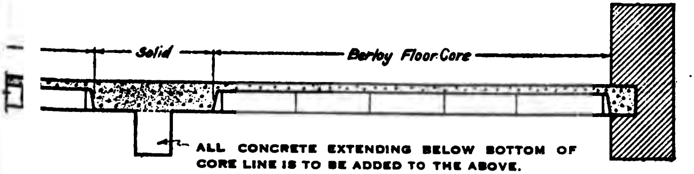
BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Per-cent-age	AVERAGE THICKNESS OF SLAB IN FT.				
	14 + 3				
	24″o.c.	24½″o.c.	25″o.c.	25½″o.c.	26″o.c.
60	.909	.919	.929	.939	.948
62	.892	.903	.913	.923	.933
64	.875	.886	.897	.907	.917
66	.858	.870	.880	.891	.901
68	.842	.853	.864	.875	.885
70	.825	.836	.848	.859	.870
72	.808	.820	.832	.843	.854
74	.791	.803	.816	.827	.839
76	.774	.787	.799	.811	.823
78	.757	.770	.783	.795	.807
80	.740	.753	.767	.779	.792
82	.723	.737	.751	.763	.776
84	.706	.720	.735	.748	.760
86	.689	.704	.719	.732	.745
88	.673	.687	.702	.716	.729
90	.656	.671	.686	.700	.713
92	.639	.654	.670	.684	.698
94	.622	.638	.654	.668	.682
96	.605	.621	.638	.652	.666
98	.588	.605	.621	.636	.651
100	.571	.588	.605	.620	.635

Percentage Column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.



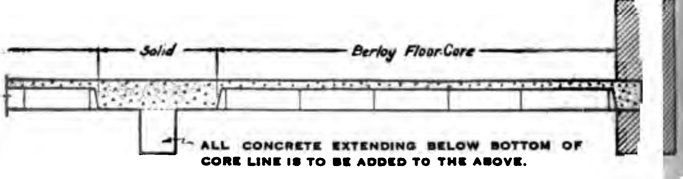
BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Per-cent-age	AVERAGE THICKNESS OF SLAB IN FT.						
	4 + 4		6 + 4		8 + 4		
	24"o.c.	24½"o.c.	24"o.c.	24½"o.c.	24"o.c.	24½"o.c.	25"o.c.
60	.521	.524	.612	.617	.704	.710	.716
62	.516	.519	.605	.610	.694	.700	.706
64	.511	.514	.597	.602	.684	.691	.697
66	.506	.509	.590	.595	.674	.681	.687
68	.501	.505	.582	.588	.665	.671	.678
70	.497	.500	.575	.581	.655	.662	.669
72	.492	.495	.568	.574	.645	.652	.659
74	.487	.490	.560	.567	.635	.642	.650
76	.482	.486	.553	.559	.625	.633	.640
78	.477	.481	.545	.552	.615	.623	.631
80	.472	.476	.538	.545	.606	.613	.621
82	.467	.471	.531	.538	.596	.603	.612
84	.462	.467	.523	.531	.586	.594	.602
86	.457	.462	.516	.523	.576	.584	.593
88	.453	.457	.508	.516	.566	.574	.584
90	.448	.452	.501	.509	.556	.564	.574
92	.443	.447	.494	.502	.546	.555	.565
94	.438	.442	.486	.495	.537	.545	.555
96	.433	.438	.479	.487	.527	.535	.546
98	.428	.433	.471	.480	.517	.526	.536
100	.423	.428	.464	.473	.507	.516	.527

Percentage Column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.



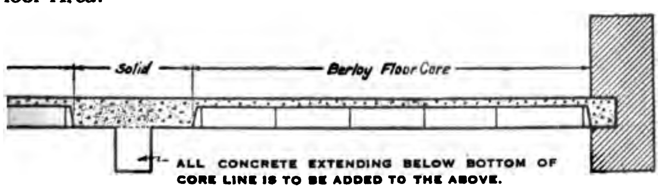
BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Per-cent-age	AVERAGE THICKNESS OF SLAB IN FT.						
	10 + 4			12 + 4			
	24″o.c.	24½″o.c.	25″o.c.	24″o.c.	24½″o.c.	25″o.c.	25½″o.c.
60	.798	.805	.812	.895	.902	.911	.920
62	.786	.793	.800	.880	.888	.897	.906
64	.773	.781	.788	.866	.873	.883	.892
66	.761	.769	.776	.851	.859	.869	.878
68	.749	.757	.764	.837	.845	.855	.865
70	.737	.745	.753	.822	.830	.841	.851
72	.724	.733	.741	.807	.816	.827	.837
74	.712	.721	.729	.793	.802	.813	.824
76	.700	.709	.717	.778	.787	.799	.810
78	.688	.697	.705	.764	.773	.785	.796
80	.675	.685	.694	.749	.759	.771	.782
82	.663	.673	.682	.734	.744	.756	.769
84	.651	.661	.670	.720	.730	.742	.755
86	.638	.649	.658	.705	.715	.728	.741
88	.626	.637	.646	.691	.701	.714	.727
90	.614	.625	.634	.676	.687	.700	.714
92	.601	.613	.622	.661	.672	.686	.700
94	.589	.601	.610	.647	.658	.672	.686
96	.577	.589	.599	.632	.644	.658	.672
98	.564	.577	.587	.617	.629	.644	.659
100	.552	.564	.575	.603	.615	.630	.645

Percentage Column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.



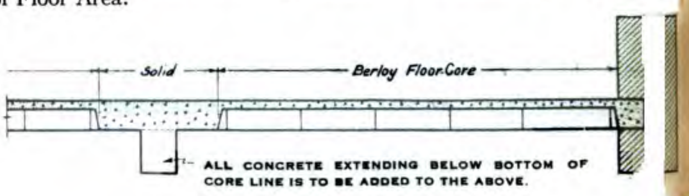
BERLOY FLOOR CORES

CUBIC FEET OF CONCRETE PER SQUARE FOOT COMBINED CORED SLAB AND SOLID SLAB AREAS

Percentage	AVERAGE THICKNESS OF SLAB IN FT.						
	14 + 4						
	24"o.c.	24½"o.c.	25"o.c.	25½"o.c.	26"o.c.		
60	.994	1.003	1.013	1.022	1.032		
62	.977	.986	.997	1.006	1.016		
64	.960	.970	.980	.990	1.001		
66	.943	.953	.964	.974	.985		
68	.926	.936	.948	.958	.970		
70	.909	.920	.932	.942	.954		
72	.892	.903	.915	.927	.938		
74	.875	.887	.899	.911	.923		
76	.859	.870	.883	.895	.907		
78	.842	.854	.867	.879	.892		
80	.825	.837	.850	.863	.876		
82	.807	.821	.834	.847	.860		
84	.791	.804	.818	.831	.845		
86	.774	.788	.802	.815	.829		
88	.757	.771	.785	.799	.814		
90	.740	.755	.769	.783	.798		
92	.724	.738	.753	.767	.783		
94	.707	.722	.737	.752	.767		
96	.690	.705	.720	.736	.751		
98	.673	.688	.704	.720	.736		
100	.656	.672	.688	.704	.720		

Percentage Column indicates proportion of Cored Slab Area to Total Area of Floor.

The table gives the average thickness of concrete per square foot of Floor Area.



BERLOY FLOOR CORES

DATA ON REINFORCING BARS

Standard Sizes Square Bars

Size in inches	¼	⅜	½	⅝	¾	⅞	1	1⅛	1¼
Net area in sq. inches	.06	.14	**.25**	.39	.56	.76	**1.00**	**1.26**	**1.55**
Wgt. per foot in lbs.	.213	.478	.85	1.33	1.91	2.60	3.40	4.30	5.31
Extras in cts. per 100 lbs.	50	25	10	5	BASE				

Standard Sizes Round Bars

Sizes in inches	¼	⅜	½	⅝	¾	⅞	1	1⅛	1¼
Net area in sq. inches	.049	**.11**	**.19**	**.30**	**.44**	**.60**	**.785**	.99	1.22
Wgt. per foot in lbs.	.167	.376	.668	1.04	1.50	2.04	.267	3.38	4.17
Circumference in inches	.785	1.178	1.570	1.963	2.356	2.749	3.141	3.534	3.927
Extras in cts. per 100 lbs.	50	25	10	5	BASE				

Cutting to length from 2 to 5 ft.............................$0.05
Cutting to length from 1 to 2 ft............................. .10
Less than 2000 lbs. of one size........................... .15
Less than 1000 lbs. of one size........................... .35

Bars with areas given in heavy type are the sizes recommended for adoption as standards by the American Concrete Institute Committee on "standardizing the specifications for steel bars for concrete reinforcement," as a conservation measure to reduce the number of sizes of bars with equivalent areas.

A saving in cost is obtained by using round bars in sizes under ¾-inch in diameter, owing to the difference in size extras between rounds and squares of equivalent areas.

Core—Depth	4"
Core—Width	20"
Concrete Slab	2"
Steel	@ 16,000 #
Concrete	@ 650 #

Table 1

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data	Width of Joists / Center to Center of Joists / Average Wt. Per Sq. Ft.	4" / 24" / 37.9 #					4½" / 24½" / 38.6 #					
Reinf. / Joist Wth.	2–½□ / 4"	2½–□ / 4"	½□–⅝○ / 4"	½□–⅝□ / 4"	⅝○–⅝□ / 4"	2–⅝□ / 4½"	2–¾○ / 4½"	⅝□–¾□ / 4½"			W L / 8
Reinf. / Joist Wth	½□–½○ / 4"	½□–½○ / 4"	2–½□ / 4"	½□–⅝○ / 4"	½□–⅝□ / 4"	⅝○–⅝□ / 4"	2–⅝□ / 4½"	⅝□–¾○ / 4½"			W L / 9
Reinf. / Joist Wth.	½□–⅝○ / 4"	2–½○ / 4"	½□–½○ / 4"	2–½□ / 4"	⅝–○½□ / 4"	2–⅝○ / 4"	⅝□–⅝○ / 4"	¾○–⅝○ / 4"			W L / 10
Reinf. / Joist Wth.	⅝○–½○ / 4"	⅝□–½○ / 4"	⅝□–½□ / 4"	½○–⅝□ / 4"	2–½□ / 4"	½□–⅝○ / 4"	½○–⅝□ / 4"	½□–⅝□ / 4"			W L / 12
R. M. In ft. lbs.	1090	1180	1340	1490	1625	1754	2010	2180			R. M. In ft. lbs.
SPAN IN FEET 6	303	328	372	414							6
7	223	241	274	304	331						7
8	171	185	210	233	254	274					8
9	135	146	166	184	200	216	248	269			9
10	109	118	134	149	163	175	201	218			10
11	90	98	111	123	134	145	166	180			11
12	76	82	93	104	113	124	140	151			12
13	65	70	80	88	96	104	119	129			13
14			68	76	85	90	102	111			14
15				66	72	78	89	97			15
16					64	69	79	86			16
17						61	70	76			17 SPAN IN FEET
18								67			18

Table 2

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	6″
Core—Width	20″
Concrete Slab	2″
Steel @	16,000 #
Concrete @	650 #

... ts / ... Center of Joists / Average Wt. Per Sq. Ft.				4″ 24″ 43.9 #		4½″ 24½″ 44.8 #	5″ 25″ 45.9 #				
Reinf. Joist Wth.	[illegible]□-[illegible]○ 4″	[illegible]□-[illegible]□ 4″	[illegible]○-[illegible]□ 4″	2-[illegible]□ 4½″	2-[illegible]○ 4½″	[illegible]□-[illegible]□ 4½″	[illegible]○-[illegible]□ 4½″	2-[illegible]□ 4½″	[illegible]□-⅞□ 5″	2-⅞□ 5″	W L / 8
Reinf. Joist Wth.	2-½□ 4″	½□-[illegible]○ 4″	[illegible]□-[illegible]□ 4″	[illegible]○-[illegible]□ 4″	2-[illegible]□ 4½″	[illegible]□-[illegible]○ 4½″	[illegible]○-[illegible]□ 4½″	[illegible]○-[illegible]□ 4½″	[illegible]□-⅞○ 4½″	[illegible]□-⅞□ 5″	W L / 9
Reinf. Joist Wth.	½□-½○ 4″	2-½□ 4″	[illegible]○-[illegible]□ 4″	2-[illegible]○ 4″	[illegible]□-[illegible]○ 4″	[illegible]○-[illegible]○ 4″	2-[illegible]□ 4½″	2-[illegible]○ 4½″	⅞○-[illegible]○ 4½″	2-[illegible]□ 4½″	W L / 10
Reinf. Joist Wth.	[illegible]□-½□ 4″	[illegible]○-[illegible]□ 4″	2-[illegible]□ 4″	[illegible]○-[illegible]○ 4″	[illegible]○-[illegible]□ 4″	[illegible]□-[illegible]□ 4″	[illegible]○-[illegible]□ 4″	[illegible]○-[illegible]○ 4″	2-[illegible]○ 4½″	[illegible]□-[illegible]□ 4½″	W L / 12
R. M. In ft. lbs.	1910	2140	2340	2560	2900	3080	3180	3530	4100	4450	R. M. In ft. lbs.
7	390	437	477	522							7
8	299	335	366	400	453		497				8
9	236	264	289	314	358	380	392	436			9
10	191	214	234	256	290	308	318	353			10
11	158	177	193	210	240	255	263	292	338		11
12	133	149	162	176	201	214	221	245	285	309	12
13	113	127	138	150	172	182	188	209	243	263	13
14	98	109	119	130	148	157	162	180	209	227	14
15	85	95	104	113	129	137	142	157	183	198	15
16	75	84	91	99	113	120	124	138	160	174	16
17	66	74	81	88	100	106	110	122	142	154	17
18	59	66	72	78	90	95	98	109	127	137	18
19		59	65	70	80	85	88	98	114	123	19
20			58	64	73	77	80	88	103	111	20
21					66	70	72	80	93	101	21
22					60	64	66	73	85	92	22
23								67	78	84	23
24									71	77	24
25									66	71	25
26										66	26
SPAN IN FEET											SPAN IN FEET

Core—Depth 12"
Core—Width 20"
Concrete Slab 2"
Steel @ 16,000 #
Concrete @ 650 #

Table 5

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data	Width of Joists Center to Center of Joists Average Wt. Per Sq. Ft.			4" 24" 64.0 #		4½" 24½" 66.2 #	5" 25" 68.2 #	5½" 25½" 70.2 #			
Reinf. Joist Wth.	2–¾ □ 4½"	¾ □–⅞ □ 5"	2–⅞ □ 5"	2–⅞ □ 5"	⅞ □–1 □ 5"	2–1⅛ ○ 5½"	1⅛ ○–1⅛ □ 5½"				$\frac{WL}{8}$
Reinf. Joist Wth.	¾ ○–¾ □ 4½"	¾ □–⅞ ○ 4½"	¾ □–⅞ □ 5"	⅞ ○–⅞ □ 5"	⅞ □–1 ○ 5"	⅞ □–1 □ 5"	2–1⅛ ○ 5½"	1⅛ ○–1⅛ □ 5½"	1⅛ ○ 1⅛ □ 5½"		$\frac{WL}{9}$
Reinf. Joist Wth.	2–¾ ○ 4½"	⅞ ○–¾ ○ 4½"	2–¾ □ 4½"	2–⅞ ○ 5"	1 ○–⅞ ○ 5"	2–1 ○ 5"	1 ○–1 □ 5"	2–1 □ 5"	1⅛ □–1 □ 5½"	2–1⅛ □ 5½"	$\frac{WL}{10}$
Reinf. Joist Wth.	⅝ ○–¾ ○ 4"	2–¾ ○ 4½"	⅝ □–¾ □ 4½"	¾ ○–¾ □ 4½"	¾ □–⅞ ○ 4½"	¾ □–⅞ □ 5"	2–⅞ □ 5"	⅞ □–1 □ 5"	2–1⅛ ○ 5½"	1⅛ ○–1⅛ □ 5½"	$\frac{WL}{12}$
R. M. In ft. lbs.	6750	7980	8580	8960	10200	11480	12920	14400	15800	17400	R. M. In ft. lbs.
11	558	660	710								11
12	469	554	596	621	708						12
13	399	472	507	530	604	679					13
14	344	408	437	456	520	585					14
15	300	359	382	398	454	510	574				15
16	264	312	335	350	399	448	505				16
17	233	276	297	310	353	397	447	498			17
18	208	247	265	276	315	354	399	444	487		18
19	187	221	238	248	283	318	358	399	437		19
20	169	200	215	224	255	287	323	360	395	435	20
21	158	181	195	203	232	260	293	327	358	395	21
22	139	165	177	185	211	236	267	298	326	360	22
23	128	151	162	169	193	217	245	272	299	329	23
24	117	139	149	155	177	199	224	250	274	302	24
25	108	128	137	143	163	184	207	231	253	278	25
26	100	118	127	132	151	170	191	213	234	258	26
27	93	110	118	122	140	158	177	198	217	239	27
28	86	102	109	114	130	146	165	184	202	222	28
29	80	95	102	106	121	136	154	171	188	207	29
30	75	89	95	99	113	127	144	160	176	193	30
31	70	83	89	93	106	119	134	150	164	181	31
		78	84	87	100	112	126	140	154	170	32

SPAN IN FEET

Table 6

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth		14″
Core—Width		20″
Concrete Slab		2″
Steel	@	16,000 #
Concrete	@	650 #

...ata	...s Center to Center of Joists Average Wt. Per Sq. Ft.	4″ 24″ 71.8 #	4½″ 24½″ 74.2 #	5″ 25″ 76.6 #	5½″ 25½″ 78.8 #

Reinf. Joist Wth.	2-¾ □ 4½″	⅞ □-¾ □ 5″	2-⅞ □ 5″	2-⅞ □ 5″	⅞ □-1 □ 5″	2-1⅛ ○ 5½″	1⅛ ○-1⅛ □ 5½″				W L / 8
Reinf. Joist Wth.	¾ ○-¾ □ 4½″	¾ □-⅞ ○ 4½″	¾ □-⅞ □ 5″	⅞ ○-⅞ □ 5″	⅞ □-1 ○ 5″	⅞ □-1 □ 5″	2-1⅛ ○ 5½″	1⅛ ○-1⅛ □ 5½″			W L / 9
Reinf. Joist Wth.	2-¾ ○ 4½″	⅞ ○-¾ ○ 4½″	2-¾ □ 4½″	2-⅞ ○ 5″	1 ○-⅞ ○ 5″	2-1 ○ 5″	1 ○-1 □ 5″	2-1 □ 5″	1⅛ □-1 □ 5½″	2-1⅛ □ 5½″	W L / 10
Reinf. Joist Wth.	⅝ ○-¾ ○ 4″	2-¾ ○ 4½″	⅝ □-¾ □ 4½″	¾ □-¾ ○ 4½″	¾ □-⅞ ○ 4½″	¾ □-⅞ □ 5″	2-⅞ □ 5″	⅞ □-1 □ 5″	2-1⅛ ○ 5½″	1⅛ ○-1⅛ □ 5½″	W L / 12
R. M. In ft. lbs.	7900	9190	10000	10410	11850	13380	14980	16820	18620	20620	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
13	466	543	591	616	702						13
14	403	469	510	530	604	682					14
15	351	408	445	463	527	594	666				15
16	308	359	391	407	463	522	585				16
17	273	318	346	360	410	463	519	582	644		17
18	244	283	308	322	366	412	463	519	575		18
19	219	254	277	289	329	371	415	466	516	572	19
20	198	230	250	260	297	334	375	420	466	516	20
21	179	208	227	236	269	303	340	381	422	468	21
22	163	190	206	215	245	276	310	348	385	426	22
23	149	174	189	197	224	253	283	318	352	390	23
24	137	159	179	181	206	232	260	292	324	358	24
25	126	147	160	167	190	214	240	269	289	330	25
26	117	136	148	154	176	198	222	249	276	305	26
27	107	127	137	143	163	184	206	231	256	283	27
28	100	118	128	133	151	170	191	215	238	263	28
29	93	110	119	124	141	159	178	200	221	245	29
30	87	102	111	116	132	149	166	187	207	229	30
31		96	104	108	123	138	156	175	194	214	31
32		90	98	102	116	130	146	164	182	202	32

Core—Depth	4″
Core—Width	20″
Concrete Slab	2½″
Steel	@ 16,000 #
Concrete	@ 650 #

Table 7

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data	Width of Joists / Center to Center of Joists / Average Wt. Per Sq. Ft.			4″ / 24″ / 43.9 #		4½″ / 24½″ / 44.5 #					
Reinf. Joist Wth.	2-½ □ 4″	2-½ □ 4″	½ □-⅝ ○ 4″	½ □-⅝ □ 4″	⅝ ○-⅝ □ 4″	2-⅝ □ 4½″	2-¾ ○ 4½″	⅝ □-¾ □ 4½″	¾ ○-¾ □ 4½″		W L / 8
Reinf. Joist Wth.	½ □-½ ○ 4″	½ ○-½ □ 4″	2-½ □ 4″	½ □-⅝ ○ 4″	½ □-⅝ □ 4″	⅝ ○-⅝ □ 4″	2-⅝ □ 4½″	⅝ □-¾ ○ 4½″	⅝ ○-¾ □ 4½″		W L / 9
Reinf. Joist Wth.	½ □-⅜ ○ 4″	2-½ ○ 4″	½ □-½ ○ 4″	2-½ □ 4″	⅝ ○-½ □ 4″	2-⅝ ○ 4″	⅝ ○-⅝ □ 4″	¾ ○-⅝ ○ 4″	2-⅝ □ 4½″		W L / 10
Reinf. Joist Wth.	⅜ ○-½ ○ 4″	⅜ □-½ ○ 4″	⅜ □-½ □ 4″	½ ○-½ □ 4″	2-½ □ 4″	½ □-⅝ ○ 4″	½ ○-⅝ □ 4″	½ □-⅝ □ 4″	⅝ □-⅝ ○ 4″		W L / 12
R. M. In ft. lbs.	1200	1310	1480	1645	1800	1970	2220	2350	2430		R. M. In ft. lbs.
6	334	364	411	457							6
7	245	268	302	336	368						7
8	188	205	232	257	282	308					8
9	148	162	183	203	222	244	274	290	300		9
10	120	131	148	165	180	197	222	235	243		10
11	99	108	122	136	149	163	184	194	201		11
12	83	91	103	114	125	137	154	163	169		12
13	71	78	88	97	107	117	131	139	144		13
14	61	67	76	84	92	100	113	120	124		14
15	53	58	66	73	80	88	99	104	108		15
16			58	64	70	77	87	92	95		16
17				57	62	68	77	81	84		17
18						61	69	73	75		18
19							62	65	67		19
20								59	61		20
SPAN IN FEET											SPAN IN FEET

Table 8

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth			**6″**
Core—Width			**20″**
Concrete Slab			**2½″**
Steel		@	**16,000 #**
Concrete		@	**650 #**

Data	Width of Joists Center to Center of Joists Average Wt. Per Sq. Ft.			4″ 24″ 49.9 #		4½″ 24½″ 50.9 #	5″ 25″ 51.9 #				
Reinf. Joist Wth.	½□-⅝○ 4″	½□-⅝□ 4″	⅝○-⅝□ 4″	2-⅝□ 4½″	2-¾○ 4½″	⅝□-¾□ 4½″	¾○-¾□ 4½″	2-¾□ 4½″	¾□-⅞□ 5″	2-⅞□ 5″	W L / 8
Reinf. Joist Wth.	2-½□ 4″	½□-⅝○ 4″	½□-⅝□ 4″	⅝○-⅝□ 4″	2-⅝□ 4½″	⅝□-¾○ 4½″	⅝○-¾□ 4½″	¾○-¾□ 4½″	¾□-⅞○ 4½″	¾□-⅞□ 5″	W L / 9
Reinf. Joist Wth.	½□-½○ 4″	2-½□ 4″	⅝○-½□ 4″	2-⅝○ 4″	⅝□-⅝○ 4″	¾○-⅝○ 4″	2-⅝□ 4½″	2-¾○ 4½″	⅞○-¾○ 4½″	2-¾□ 4½″	W L / 10
Reinf. Joist Wth.	⅜□-½□ 4″	½○-½□ 4″	2-½□ 4″	½○-⅝○ 4″	½○-⅝□ 4″	½□-⅝□ 4″	⅝○-⅝□ 4″	⅝○-¾○ 4″	2-¾○ 4½″	⅝□-¾□ 4½″	W L / 12
R. M. In ft. lbs.	2055	2290	2520	2760	3120	3320	3415	3790	4420	4795	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
6	571	637									6
7	420	468	515	564							7
8	322	358	394	431	488		534				8
9	254	283	311	341	385	410	421	468			9
10	206	229	252	276	312	332	342	379			10
11	170	190	208	228	258	274	282	313	366		11
12	143	159	175	192	216	230	237	263	307	333	12
13	122	135	149	163	185	197	202	224	262	284	13
14	105	117	129	141	159	170	174	193	226	244	14
15	91	102	112	123	139	148	152	169	197	213	15
16	80	90	98	108	122	130	133	148	173	187	16
17	71	79	87	95	108	115	118	131	153	166	17
18	63	71	78	85	96	102	105	117	137	148	18
19	57	64	70	76	87	92	95	105	123	133	19
20		57	63	69	78	83	85	95	111	120	20
21			57	63	71	75	78	86	100	109	21
22				57	65	69	71	78	92	99	22
23					59	63		72	84	90	23
24						58			77	83	24
25									71	76	25

Core—Depth 8"
Core—Width 20"
Concrete Slab 2½"
Steel @ 16,000 #
Concrete @ 650 #

Table 9

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data											
Width of Joists Center to Center of Joists Average Wt. Per Sq. Ft.					4" 24" 56.1 #	4½" 24½" 57.5 #	5" 25" 58.9 #	5½" 25½" 60.2 #			
Reinf. Joist Wth.	2-¾ O 4½"	⅝ □-¾ □ 4½"	¾ O-⅞ O 4½"	2-¾ □ 4½"	¾ □-⅞ □ 5"	2-⅞ □ 5"	2-⅞ □ 5"	1 □-⅞ □ 5"	2-1⅛ O 5½"	2-1 □ 5"	$\frac{W L}{8}$
Reinf. Joist Wth.	2-⅝ □ 4½"	¾ O-⅝ □ 4½"	⅝ □-¾ □ 4½"	¾ □-¾ O 4½"	¾ □-⅞ O 4½"	¾ □-⅞ □ 5"	⅞ □-⅞ O 5"	⅞ □-1 O 5"	⅞ □-1 □ 5"	1 O-1 □ 5"	$\frac{W L}{9}$
Reinf. Joist Wth.	⅝ □-⅝ O 4"	¾ O-⅝ O 4"	¾ O-⅝ □ 4½"	2-¾ O 4½"	⅞ O-¾ O 4½"	2-¾ □ 4½"	2-⅞ O 5"	1 O-⅞ O 5"	2-1 O 5"	1 □-⅞ O 5"	$\frac{W L}{10}$
Reinf. Joist Wth.	½ O-⅝ □ 4"	½ □-⅝ O 4"	⅝ O-⅝ □ 4"	⅝ O-¾ O 4"	2-¾ O 4½"	⅝ □-¾ □ 4½"	¾ □-⅞ O 4½"	¾ □-⅞ O 4½"	¾ □-⅞ □ 5"	⅞ O-⅞ □ 5"	$\frac{W L}{12}$
R. M. In ft. lbs.	4000	4250	4620	4880	5690	6150	6400	7260	8180	8325	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
8	625	664									8
9	494	525	570	604							9
10	400	425	462	488							10
11	330	351	382	403	470	508	529				11
12	278	295	321	339	395	426	445				12
13	237	252	274	289	337	364	379	430			13
14	204	217	236	249	290	314	327	370	417		14
15	178	189	206	217	253	273	285	323	364	370	15
16	156	166	180	191	222	240	250	284	320	325	16
17	138	147	160	169	197	213	222	251	283	288	17
18	123	131	143	151	176	190	198	224	253	257	18
19	111	118	128	135	158	170	177	201	226	231	19
20	100	106	116	122	142	154	160	182	204	208	20
21	91	96	105	111	129	139	145	165	185	189	21
22	83	88	96	101	118	127	132	150	169	172	22
23	76	81	88	92	108	116	121	137	155	157	23
24	69	74	80	85	99	107	111	126	142	145	24
25	64	68	74	78	91	99	102	116	131	133	25
26			68	72	84	91	95	107	121	123	26
27				67	78	85	88	100	112	114	27
28						79	82	93	104	106	28
29						73	76	86	97	99	29
						68	71	81	91	93	30

Table 10

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	10"
Core—Width	20"
Concrete Slab	2½
Steel @	16,000 #
Concrete @	650 #

Data	...ists ...enter of Joists Average Wt. Per Sq. Ft.			4" 24" 62.7 #		4½" 24½" 64.5 #	5" 25" 66.2 #	5½" 25½" 67.8 #			
Reinf. Joist Wth.	2-¾○ 4½"	⅝□-¾□ 4½"	¾○-⅞○ 4½"	2-¾□ 4½"	¾□-⅝□ 5"	2-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"	W L / 8
Reinf. Joist Wth.	2-⅝□ 4½"	⅝□-¾○ 4½"	⅝□-¾□ 4½"	¾○-¾□ 4½"	¾□-⅞○ 4½"	¾□-⅝□ 5"	⅞□-⅝○ 5"	⅞□-1○ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	W L / 9
Reinf. Joist Wth.	⅝□-⅝○ 4"	¾○-⅝○ 4"	¾○-⅝□ 4½"	2-¾○ 4½"	⅞○-⅝○ 4½"	2-⅝□ 4½"	2-⅞○ 5"	1○-⅞○ 5"	2-1○ 5"	1○-1□ 5"	W L / 10
Reinf. Joist Wth.	⅝○-⅝□ 4"	⅝□-⅝○ 4"	⅝○-⅝□ 4"	⅝○-¾○ 4"	2-¾○ 4½"	⅝□-¾□ 4½"	¾□-¾○ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	W L / 12
R. M. In ft. lbs.	4890	5200	5660	5980	7000	7550	7860	8930	10020	12320	R. M. In ft. lbs.
8	764	813	884								8
9	604	642	699	739							9
10	489	520	566	598	700						10
11	404	430	468	494	579	623	650				11
12	340	361	394	415	486	525	546	620			12
13	289	307	335	354	414	446	465	528			13
14	250	266	289	305	357	385	403	455	511		14
15	217	231	252	266	311	336	350	397	445		15
16	191	203	221	234	273	295	307	349	391		16
17	169	180	196	207	242	262	272	309	347	427	17
18	151	161	175	185	216	233	243	276	309	380	18
19	135	144	157	166	194	209	218	247	277	341	19
20	122	130	142	150	175	189	197	223	250	308	20
21	111	118	128	136	159	171	178	203	227	280	21
22	101	108	117	124	145	156	163	185	207	254	22
23	93	98	107	113	133	143	149	169	189	233	23
24	85	90	98	104	122	131	137	155	174	214	24
25	78	83	91	96	112	121	125	143	160	197	25
26	72	77	84	89	103	112	116	132	148	182	26
27	67	72	78	82	96	104	108	123	137	169	27
28		67	72	76	89	97	100	114	128	157	28
29			67	71	83	90	94	106	119	146	29
30					78	84	88	99	111	137	30
31									104	128	31

SPAN IN FEET

Core—Depth 12"
Core—Width 20"
Concrete Slab 2½"
Steel @ 16,000 #
Concrete @ 650 #

Table 11

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data	Width of Joists Center to Center of Joists Average Wt. Per Sq. Ft.			4" 24" 70.0 #	4½" 24½" 72.2 #	5" 25" 74.2 #	5½" 25½" 76.2 #				
Reinf. Joist Wth.	2-¾□ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"				$\frac{WL}{8}$
Reinf. Joist Wth.	¾○-¾□ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	⅞□-⅞○ 5"	⅞□-1○ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"			$\frac{WL}{9}$
Reinf. Joist Wth.	2-¾○ 4½"	⅞○-¾○ 4½"	2-¾□ 4½"	2-⅞○ 5"	1○-⅞○ 5"	2-1○ 5"	1○-1□ 5"	2-1□ 5"	1⅛□-1□ 5½"	2-1⅛□ 5½"	$\frac{WL}{10}$
Reinf. Joist Wth.	⅝○-¾○ 4"	2-¾○ 4½"	⅝□-¾□ 4½"	¾□-¾○ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"	$\frac{WL}{12}$
R. M. In ft. lbs.	7075	8300	8940	9320	10600	11930	13520	15020	16450	18250	R. M. In ft. lbs.
9	873										9
10	708	830	894	932							10
11	585	686	740	765							11
12	491	576	621	647	736						12
13	419	491	529	552	628	706					13
14	361	424	456	476	541	609					14
15	314	369	397	415	471	531	602				15
16	276	324	349	364	414	466	528				16
17	245	287	309	322	366	413	468	520			17
18	218	256	276	288	328	369	417	464	507		18
19	196	230	248	258	294	330	375	416	456		19
20	177	207	223	233	265	298	338	376	411	456	20
21	160	188	203	211	241	271	307	341	373	414	21
22	147	172	185	193	219	247	280	311	340	377	22
23	134	157	169	176	200	226	256	284	311	345	23
24	123	144	155	162	184	207	235	261	286	317	24
25	113	133	143	149	170	191	217	241	263	292	25
26	105	123	132	138	157	177	200	222	244	270	26
27	97	114	123	128	146	164	186	206	226	250	27
28	91	106	114	119	135	152	173	192	210	233	28
29	84	99	106	111	126	142	161	179	196	217	29
30	79	92	99	104	118	133	150	167	183	203	30
[illegible]	[illegible]	86	93	97	110	124	141	156	171	190	31
[illegible]	[illegible]	81	87	91	104	116	132	147	160	178	32

SPAN IN FEET

Table 12

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth			14"
Core—Width			20"
Concrete Slab			2½"
Steel	@		16,000 #
Concrete	@		650 #

Data	ists Center ~ ~enter of Joists Average Wt. Per Sq. Ft.			4" 24" 77.8 #		4½" 24½" 80.2 #	5" 25" 82.6 #	5½" 25½" 84.8 #			
Reinf. Joist Wth.	2-¾□ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"				W L / 8
Reinf. Joist Wth.	¾○-¾□ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	⅞□-⅞○ 5"	⅞□-1○ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"			W L / 9
Reinf. Joist Wth.	2-¾○ 4½"	⅞○-¾○ 4½"	2-¾□ 4½"	2-⅞○ 5"	1○-⅞○ 5"	2-1○ 5"	1○-1□ 5"	2-1□ 5"	1⅛□-1□ 5½"	2-1⅛□ 5½"	W L / 10
Reinf. Joist Wth.	¾○-¾○ 4"	2-¾○ 4½"	¾□-¾□ 4½"	⅞□-¾○ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"	W L / 12
R. M. In ft. lbs.	8180	9560	10380	10780	12280	13880	15620	17400	19020	21250	R. M. In ft. lbs.
10	818	956	1038								10
11	676	790	858	890	1012						11
12	568	664	721	749	853						12
13	484	566	614	638	726	820					13
14	418	488	530	550	626	708					14
15	364	425	462	480	546	616	695				15
16	320	374	406	421	480	542	610				16
17	283	330	359	373	425	480	542	603	658		17
18	252	295	320	333	380	428	482	537	587		18
19	227	265	288	299	340	385	434	482	527	589	19
20	204	239	260	270	307	347	390	435	476	532	20
21	186	217	236	245	278	315	354	395	432	482	21
22	169	198	215	223	254	287	323	360	393	440	22
23	155	181	196	204	232	263	295	329	360	402	23
24	142	166	180	187	214	241	271	302	331	369	24
25	131	153	166	173	197	222	250	278	304	340	25
26	121	142	154	160	182	205	231	258	282	314	26
27	112	131	143	148	169	190	214	239	261	292	27
28	104	122	133	138	157	177	199	222	243	271	28
29	97	114	124	128	146	165	186	207	226	253	29
30	91	106	116	120	137	154	174	193	212	236	30
31	85	100	108	112	128	145	163	181	198	221	31
32	80	93	102	105	120	136	153	170	186	208	32
SPAN IN FEET											SPAN IN FEET

Table 13

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	**4″**
Core—Width	**20″**
Concrete Slab	**3″**
Steel	**@ 16,000 #**
Concrete	**@ 650 #**

Data			
Width of Joists		4″	4½″
Center to Center of Joists		24″	24½″
Average Wt. Per Sq. Ft.		49.9 #	50.6 #

Reinf. Joist Wth.	2-½□ 4″	2-½□ 4″	⅝□-⅝○ 4″	½□-⅝□ 4″	⅝○-⅝□ 4″	2-⅝□ 4½″	2-¾○ 4½″	⅝□-¾□ 4½″	¾○-¾□ 4½″	¾○-⅞○ 4½″	W L / 8
Reinf. Joist Wth.	⅝□-½○ 4″	½○-½□ 4″	2-½□ 4″	½□-⅝○ 4″	½□-⅝□ 4″	⅝○-⅝□ 4″	2-⅝□ 4½″	⅝□-¾○ 4½″	⅝○-¾□ 4½″	⅝□-¾□ 4½″	W L / 9
Reinf Joist Wth.	½□-⅝○ 4″	2-½○ 4″	½□-½○ 4″	2-½□ 4″	⅝○-½□ 4″	2-⅝○ 4″	⅝○-⅝□ 4″	¾○-⅝○ 4″	2-⅝□ 4½″	¾○-⅝□ 4½″	W L / 10
Reinf. Joist Wth.	⅝○-½○ 4″	⅝□-½○ 4″	⅝□-½□ 4″	½○-½□ 4″	2-½□ 4″	½□-⅝○ 4″	½○-⅝□ 4″	½□-⅝□ 4″	⅝□-⅝○ 4″	⅝○-⅝□ 4″	W L / 12
R. M. In ft. lbs.	1320	1430	1620	1800	1970	2165	2430	2580	2660	2800	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
6	367	397	450	500							6
7	270	292	331	368	402	442					7
8	206	224	253	282	308	338	380				8
9	163	177	200	222	244	267	300	319	328	346	9
10	132	143	162	180	197	217	243	258	266	280	10
11	109	118	134	149	163	179	201	213	220	231	11
12	92	100	113	125	137	151	169	179	185	194	12
13	78	85	96	107	117	128	144	153	157	166	13
14	67	73	83	92	100	111	124	132	136	143	14
15	59	64	72	80	88	96	108	115	118	124	15
16			63	70	77	85	95	101	104	109	16
17				62	68	75	84	89	92	97	17
18						67	75	80	82	86	18
19						60	67	72	74	78	19
20							61	65	67	70	20
21										63	21

Table 14

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth		6"
Core—Width		20"
Concrete Slab		3"
Steel	@	16,000 #
Concrete	@	650 #

Data	Width of Joists Center to Center of Joists Average Wt Per Sq. Ft.			4" 24" 55.9 #		4½" 24½" 57.0 #	5" 25" 57.9 #				
Reinf. Joist Wth.	½□–½○ 4"	½□–½□ 4"	½○–½□ 4"	2–½□ 4½"	2–½○ 4½"	½□–½□ 4½"	½○–½□ 4½"	2–½□ 4½"	½□–½□ 5"	2–½□ 5"	W L / 8
Reinf. Joist Wth.	2–½□ 4"	½□–½○ 4"	½□–½□ 4"	½○–½□ 4"	2–½□ 4½"	½□–½○ 4½"	½○–½□ 4½"	½○–½□ 4½"	½□–½○ 4½"	½□–½□ 5"	W L / 9
Reinf. Joist Wth.	½□–½○ 4"	2–½□ 4"	½○–½□ 4"	2–½○ 4"	½□–½○ 4"	½○–½○ 4"	2–½□ 4½"	2–½○ 4½"	½○–½○ 4½"	2–½□ 4½"	W L / 10
Reinf. Joist Wth.	½□–½□ 4"	½○–½□ 4"	2–½□ 4"	½○–½○ 4"	½○–½□ 4"	½□–½□ 4"	½○–½□ 4"	½○–½○ 4"	2–½○ 4½"	½□–½□ 4½"	W L / 12
R. M. In ft. lbs.	2200	2450	2690	2950	3340	3545	3660	4080	4735	5130	R. M. In ft. lbs.
SPAN IN FEET											**SPAN IN FEET**
6	610	681									6
7	449	500	550	602							7
8	344	383	421	461	522		572				8
9	272	303	332	364	412	438	452	504			9
10	220	245	269	295	334	355	366	408			10
11	182	202	222	244	276	293	303	337	391		11
12	153	170	187	205	232	246	254	283	328	356	12
13	130	145	159	174	198	210	216	241	280	304	13
14	112	125	138	150	170	181	187	208	241	262	14
15	98	109	120	131	148	157	163	181	210	228	15
16	86	96	105	115	131	138	143	159	185	200	16
17	77	85	93	102	115	122	126	141	164	178	17
18	68	76	83	91	103	109	113	126	146	158	18
19	61	68	75	82	93	98	101	113	131	142	19
20		61	67	74	83	89	92	102	118	128	20
21			61	67	76	80	83	93	107	116	21
22				61	69	73	76	84	98	106	22
23					63	67				97	23
24										89	24

Table 15

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

ore—Depth	8"
ore—Width	20"
oncrete Slab	3"
teel @	16,000 #
oncrete @	650 #

Data											
Width of Joists				4"		4½"	5"	5½"			
Center to Center of Joists				24"		24½"	25"	25½"			
Average Wt. Per Sq. Ft.				62.1 #		63.5 #	64.9 #	66.2 #			
Reinf. Joist Wth.	2-¾ ○ 4½"	⅝ □-¾ □ 4½"	¾ ○-⅞ ○ 4½"	2-¾ □ 4½"	¾ □-⅞ □ 5"	2-⅞ □ 5"	2-⅞ □ 5"	1 □-⅞ □ 5"	2-1⅛ ○ 5½"	2-1 □ 5"	W L / 8
Reinf. Joist Wth.	2-⅝ □ 4"	¾ ○-⅝ □ 4½"	⅝ □-¾ □ 4½"	¾ □-¾ ○ 4½"	¾ □-⅞ ○ 4½"	¾ □-⅞ □ 5"	⅞ □-⅞ ○ 5"	⅞ □-1 ○ 5"	⅞ □—1 □ 5"	1 ○-1 □ 5"	W L / 9
Reinf. Joist Wth.	⅝ □-⅝ ○ 4"	¾ ○-⅝ ○ 4"	¾ ○-⅝ □ 4½"	2-¾ ○ 4½"	⅞ ○-¾ ○ 4½"	2-¾ □ 4½"	2-⅞ ○ 5"	1 ○-⅞ ○ 5"	2-1 ○ 5"	1 □-⅞ ○ 5"	W L / 10
Reinf. Joist Wth.	½ ○-⅝ □ 4"	½ □-⅝ ○ 4"	⅝ ○-⅝ □ 4"	⅝ ○-¾ ○ 4"	2-¾ ○ 4½"	⅝ □-¾ □ 4½"	¾ □-¾ ○ 4½"	¾ □-⅞ ○ 4½"	¾ □-⅞ □ 5"	⅞ ○-⅞ □ 5"	W L / 12
R. M. In ft. lbs.	4220	4490	4880	5175	6025	6510	6750	7680	8640	8810	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
8	659	702	763								8
9	521	554	602	639							9
10	422	449	488	518	603						10
11	349	371	403	428	498	538	558				11
12	293	312	339	359	418	452	468	534			12
13	250	266	289	306	357	385	400	454			13
14	215	229	249	264	307	332	344	392	441	450	14
15	187	200	217	230	268	289	300	341	384	391	15
16	165	175	191	202	235	254	264	300	338	344	16
17	146	155	169	179	208	225	233	266	299	305	17
18	130	139	151	159	186	201	208	237	267	272	18
19	117	124	135	143	167	180	187	213	239	244	19
20	106	112	122	129	150	163	169	192	216	220	20
21	96	102	111	117	137	148	153	174	196	200	21
22	87	93	101	107	125	135	139	159	178	182	22
23	80	85	92	98	114	123	128	145	163	167	23
24	73	78	85	90	105	113	117	133	150	153	24
25	68	72	78	83	96	104	108	123	138	141	25
26		66	72	77	89	96	100	114	128	130	26
27			67	71	83	89	93	105	118	121	27
28				66	77	83	86	98	110	112	28
29					72	77	80	91	103	105	29
[illegible]					67	72	75	85	96	98	30

Table 16

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	10"
Core—Width	20"
Concrete Slab	3"
Steel @	16,000 #
Concrete @	650 #

Data / Center to Center of Joists / Average Wt. Per Sq. Ft.				4" 24" 68.7 #		4½" 24½" 70.5 #	5" 25" 72.2 #	5½" 25½" 73.8 #			
Reinf. Joist Wth.	2-¾ ○ 4½"	⅝ □-¾ □ 4½"	¾ ○-⅞ ○ 4½"	2-¾ □ 4½"	¾ □-⅞ □ 5"	2-⅞ □ 5"	2-⅞ □ 5"	⅞ □-1 □ 5"	2-1⅛ ○ 5½"	1⅛ ○-1⅛ □ 5½"	W L / 8
Reinf. Joist Wth.	2-⅝ □ 4½"	⅝ □-¾ ○ 4½"	⅝ □-¾ □ 4½"	¾ ○-¾ □ 4½"	¾ □-⅞ ○ 4½"	¾ □-⅞ □ 5"	⅞ □-⅞ ○ 5"	⅞ □-1 ○ 5"	⅞ □-1 □ 5"	2-1⅛ ○ 5½"	W L / 9
Reinf. Joist Wth.	⅝ □-⅝ ○ 4"	¾ ○-⅝ ○ 4"	¾ ○-⅝ □ 4½"	2-¾ ○ 4½"	⅞ ○-¾ ○ 4½"	2-¾ □ 4½"	2-⅞ ○ 5"	1 ○-⅞ ○ 5"	2-1 ○ 5"	1 ○-1 □ 5"	W L / 10
Reinf. Joist Wth.	½ ○-⅝ □ 4"	½ □-⅝ ○ 4"	⅝ ○-⅝ □ 4"	⅝ ○-¾ ○ 4"	2-¾ ○ 4½"	⅝ □-¾ □ 4½"	¾ □-¾ ○ 4½"	¾ □-⅞ ○ 4½"	¾ □-⅞ □ 5"	2-⅞ □ 5"	W L / 12
R. M. In ft. lbs.	5100	5440	5900	6285	7320	7880	8210	9340	10500	11880	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
8	798	850	923								8
9	630	672	729	775							9
10	510	544	590	629	732						10
11	422	450	487	519	605	651	678				11
12	354	378	410	436	508	548	570	648			12
13	302	322	349	372	433	466	486	552			13
14	260	277	301	321	373	402	419	477	535		14
15	226	242	262	279	325	351	365	415	466	528	15
16	199	213	230	245	286	308	320	365	410	464	16
17	176	188	204	217	253	273	284	323	363	411	17
18	157	168	182	194	226	243	253	288	324	367	18
19	141	151	163	174	203	219	227	259	291	329	19
20	128	136	148	157	183	197	205	234	262	297	20
21	116	123	134	143	166	179	186	212	238	269	21
22	105	112	122	130	151	163	170	193	217	245	22
23	97	103	111	119	138	149	155	177	198	223	23
24	88	95	103	109	127	137	143	162	182	206	24
25	82	87	94	100	117	126	131	150	168	190	25
26	75	81	87	93	108	117	121	138	155	176	26
27	70	75	81	86	100	108	113	128	144	163	27
28	65	69	75	80	93	100	104	119	134	152	28
29		65	70	75	87	94	98	111	125	141	29
30			66	70	81	88	91	104	117	132	30

Core—Depth 12″
Core—Width 20″
Concrete Slab 3″
Steel @ 16,000 #
Concrete @ 650 #

Table 17

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data	Width of Joists Center to Center of Joists Average Wt. Per Sq. Ft.			4″ 24″ 76.0 #		4½″ 24½″ 78.2 #	5″ 25″ 80.2 #	5½″ 25½″ 82.2 #			
Reinf. Joist Wth.	2-¾□ 4½″	¾□-⅞□ 5″	2-⅞□ 5″	2-⅞□ 5″	⅞□-1□ 5″	2-1⅛○ 5½″	1⅛○-1⅛□ 5½″				W L / 8
Reinf. Joist Wth.	¾○-¾□ 4½″	¾□-⅞○ 4½″	¾□-⅞□ 5″	⅞□-⅞○ 5″	⅞□-1○ 5″	⅞□-1□ 5″	2-1⅛○ 5½″	1⅛○-1⅛□ 5½″			W L / 9
Reinf. Joist Wth.	2-¾○ 4½″	⅞○-¾○ 4½″	2-¾□ 4½″	2-⅞○ 5″	1○-⅞○ 5″	2-1○ 5″	1○-1□ 5″	2-1□ 5″	1⅛□-1□ 5½″	2-1⅛□ 5½″	W L / 10
Reinf. Joist Wth.	⅝○-¾○ 4″	2-¾○ 4½″	⅝□-¾□ 4½″	¾□-¾○ 4½″	¾□-⅞○ 4½″	¾□-⅞□ 5″	2-⅞□ 5″	⅞□-1□ 5″	2-1⅛○ 5½″	1⅛○-1⅛□ 5½″	W L / 12
R. M. In ft. lbs.	7340	8590	9280	9640	11150	12400	14010	15600	17150	19000	R. M. In ft. lbs.
9	905										9
10	734	859	928	964							10
11	606	710	767	796							11
12	510	596	644	669	774						12
13	434	508	549	570	660	734					13
14	375	438	473	492	569	632					14
15	326	382	413	428	496	551	623				15
16	287	335	362	376	426	484	548				16
17	254	297	320	333	386	429	485	539	593		17
18	227	265	287	297	344	383	433	482	529		18
19	203	238	257	267	309	343	389	432	475	526	19
20	184	215	232	241	279	310	351	390	429	475	20
21	166	195	210	229	253	281	318	354	389	431	21
22	151	177	192	199	230	256	289	322	354	393	22
23	139	162	176	182	211	234	265	295	324	359	23
24	127	149	161	167	194	215	243	271	298	330	24
25	117	137	149	154	178	198	224	250	274	304	25
26	109	127	138	143	165	184	208	231	254	281	26
27	101	118	127	132	153	170	192	214	235	261	27
28	94	109	119	123	142	158	179	199	219	242	28
29	87	102	111	115	133	146	167	186	204	226	29
30	82	95	103	107	124	138	156	173	191	211	30
31	76	89	97	100	116	129	146	163	179	198	31
		84	91	94	109	121	137	152	167	185	32
SPAN IN FEET											SPAN IN FEET

Table 18

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	14"
Core—Width	20"
Concrete Slab	3"
Steel @	16,000 #
Concrete @	650 #

ts ... nter of Joists Average Wt. Per Sq. Ft.				4" 24" 83.8 #		4½" 24½" 86.2 #	5" 25" 88.6 #	5½" 25½" 90.8 #			
Reinf. Joist Wth.	2-¾□ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"				W L / 8
Reinf. Joist Wth.	¾○-¾□ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	⅞□-⅞○ 5"	⅞□-1○ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"			W L / 9
Reinf. Joist Wth.	2-¾○ 4½"	⅞○-¾○ 4½"	2-¾□ 4½"	2-⅞○ 5"	1○-⅞○ 5"	2-1○ 5"	1○-1□ 5"	2-1□ 5"	1⅛□-1□ 5½"	2-1⅛□ 5½"	W L / 10
Reinf. Joist Wth.	⅝○-¾○ 4"	2-¾○ 4½"	⅝□-¾□ 4½"	¾□-¾○ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"	W L / 12
R. M. In ft. lbs.	8450	9890	10650	11110	12720	14325	16150	18000	19790	21990	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
10	845	989	1065								10
11	698	816	880	919	1050						11
12	586	686	740	772	883						12
13	500	585	630	658	753	849					13
14	431	504	544	567	649	731	824				14
15	376	439	474	494	566	637	718				15
16	330	386	416	435	497	560	632	703			16
17	292	342	368	384	440	495	558	622	683		17
18	260	305	329	343	393	442	498	556	610		18
19	234	274	295	308	352	397	447	498	548	610	19
20	211	247	266	278	318	358	404	450	495	550	20
21	192	224	243	252	288	325	366	408	448	499	21
22	175	204	221	230	263	296	334	372	409	454	22
23	160	187	201	210	240	271	305	340	374	416	23
24	147	172	185	193	221	249	280	312	343	382	24
25	135	158	171	178	203	229	258	288	316	352	25
26	125	146	158	165	188	212	239	266	293	326	26
27	116	136	146	152	174	196	222	247	271	302	27
28	108	126	136	142	162	183	206	230	252	280	28
29	101	118	127	132	151	170	192	214	235	261	29
30	94	110	118	123	141	159	179	200	220	244	30
31	88	103	111	115	132	149	168	187	206	229	31
32	83	97	104	109	124	140	158	176	193	214	32

Core—Depth		4″
Core—Width		20″
Concrete Slab		4″
Steel	@	16,000 #
Concrete	@	650 #

Table 19

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data		
Width of Joists	4″	4½″
Center to Center of Joists	24″	24½″
Average Wt. Per Sq. Ft.	61.9 #	62.5 #

Reinf. Joist Wth.	2-½□ 4″	2-½□ 4″	½□-⅝○ 4″	½□-⅝□ 4″	⅝○-⅝□ 4″	2-⅝□ 4½″	2-¾○ 4½″	⅝□-¾□ 4½″	¾○-¾□ 4½″	¾○-⅞○ 4½″	W L / 8
Reinf. Joist Wth.	½□-½○ 4″	½○-½□ 4″	2-½□ 4″	½□-⅝○ 4″	½□-⅝□ 4″	⅝○-⅝□ 4″	2-⅝□ 4½″	⅝□-¾○ 4½″	⅝○-¾□ 4½″	⅝□-¾□ 4½″	W L / 9
Reinf. Joist Wth.	½□-⅝○ 4″	2-½○ 4″	½□-½○ 4″	2-½□ 4″	⅝○-½□ 4″	2-⅝○ 4″	⅝○-⅝□ 4″	¾○-⅝○ 4″	2-⅝□ 4½″	¾○-⅝□ 4½″	W L / 10
Reinf. Joist Wth.	⅝○-½○ 4″	⅝□-½○ 4″	⅝□-½□ 4″	½○-½□ 4″	2-½□ 4″	½□-⅝○ 4″	½○-⅝□ 4″	⅝□-⅝□ 4″	⅝□-⅝○ 4″	⅝○-⅝□ 4″	W L / 12
R. M. In ft. lbs.	1550	1675	1900	2115	2320	2545	2875	3060	3130	3310	R. M. In ft. lbs.
SPAN IN FEET											**SPAN IN FEET**
6	430	465	528	588							6
7	317	342	388	432	474	519					7
8	242	262	297	330	363	398	450		489		8
9	192	207	235	261	287	314	355	378	387	409	9
10	155	168	190	212	232	255	288	306	313	331	10
11	128	138	157	175	192	211	238	253	259	274	11
12	108	116	132	147	161	177	200	213	217	230	12
13	92	99	112	125	137	151	170	181	185	196	13
14	79	86	97	108	118	130	147	156	159	169	14
15	69	75	84	94	103	113	128	136	139	147	15
16	61	66	74	83	91	100	112	120	122	129	16
17		58	66	73	81	88	100	106	108	115	17
18				66	72	79	89	95	97	102	18
19					65	71	80	85	87	92	19
20						64	72	77	78	83	20
21								70	71	75	21
22									65	68	22
23										62	23

Table 20

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth			6"
Core—Width			20"
Concrete Slab			4"
Steel		@	16,000 #
Concrete		@	650 #

Width of Joists	4"	4½"	5"
[illegible]ter of Joists	24"	24½"	25"
Average Wt. Per Sq. Ft.	67.9 #	68.9 #	69.9 #

Reinf. Joist Wth.	½□–⅝○ 4"	½□–⅝□ 4"	⅝○–⅝□ 4"	2–⅝□ 4½"	2–¾○ 4½"	⅝□–¾□ 4½"	2–¾□ 4½"	2–¾□ 4½"	¾□–¾□ 5"	2–¾□ 5"	W L / 8
Reinf. Joist Wth.	2–½□ 4"	½□–⅝○ 4"	½□–⅝□ 4"	⅝○–⅝□ 4"	2–⅝□ 4½"	⅝□–¾○ 4½"	¾○–¾□ 4½"	¾○–¾□ 4½"	¾□–¾○ 4½"	¾□–¾□ 5"	W L / 9
Reinf. Joist Wth.	½□–⅝○ 4"	2–½□ 4"	⅝○–½□ 4"	2–⅝○ 4"	⅝□–⅝○ 4"	¾○–⅝○ 4"	2–¾□ 4½"	2–¾○ 4½"	¾○–¾○ 4½"	2–¾□ 4½"	W L / 10
Reinf. Joist Wth.	⅝□–½□ 4"	½○–½□ 4"	2–½□ 4"	½○–⅝○ 4"	½○–⅝□ 4"	½□–⅝□ 4"	¾○–¾□ 4"	¾○–¾○ 4"	2–¾○ 4½"	¾□–¾□ 4½"	W L / 12
R. M. In ft. lbs.	2480	2760	3045	3335	3785	4010	4130	4630	5380	5800	R. M. In ft. lbs.
SPAN IN FEET											**SPAN IN FEET**
6	690	767									6
7	506	564	622	682							7
8	388	431	476	522	592		646				8
9	306	341	376	412	468	495	510	572			9
10	248	276	305	334	379	401	413	463			10
11	205	228	252	276	313	331	341	383	445	479	11
12	172	192	211	232	263	279	287	322	374	403	12
13	147	163	180	198	224	238	245	274	319	343	13
14	127	141	156	170	193	205	211	236	274	296	14
15	110	123	135	148	168	178	184	206	239	258	15
16	97	108	119	131	148	157	161	181	210	226	16
17	86	95	105	115	131	138	143	160	186	200	17
18	77	85	94	103	117	124	127	143	166	179	18
19	69	76	84	93	105	111	114	129	149	161	19
20	62	69	76	83	95	100	103	116	135	145	20
21		63	69	76	86	91	94	105	122	132	21
22			63	69	78	83	85	96	111	120	22
23				63	72	76	78	88	102	110	23
24						70	72	80	93	101	24
25							66	74	86	93	25
26								69	80	86	26
27									74	80	27
28										74	28

Core—Depth 8″
Core—Width 20″
Concrete Slab 4″
Steel @ 16,000 #
Concrete @ 650 #

Table 21

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data											
Width of Joists / Center to Center of Joists / Average Wt. Per Sq. Ft.					4″ 24″ 74.1 #	4½″ 24½″ 75.5 #	5″ 25″ 76.9 #	5½″ 25½″ 78.2 #			
Reinf. / Joist Wth.	2-¾○ 4½″	⅝□-¾□ 4½″	¾○-⅞○ 4½″	2-¾□ 4½″	¾□-⅞□ 5″	2-⅞□ 5″	2-⅞□ 5″	1□-⅞□ 5″	2-1⅛○ 5½″	2-1□ 5″	$\frac{WL}{8}$
Reinf. / Joist Wth.	2-⅝□ 4½″	¾○-⅝□ 4½″	⅝□-¾□ 4½″	¾□-¾○ 4½″	¾□-⅞○ 4½″	¾□-⅝□ 5″	⅞□-⅝○ 5″	⅞□-1○ 5″	⅞□-1□ 5″	1○-1□ 5″	$\frac{WL}{9}$
Reinf. / Joist Wth.	⅝□-⅝○ 4″	¾○-⅝○ 4″	¾○-⅝□ 4½″	2-¾○ 4½″	⅞○-¾○ 4½″	2-¾□ 4½″	2-⅞○ 5″	1○-⅞○ 5″	2-1○ 5″	1□-⅞○ 5″	$\frac{WL}{10}$
Reinf. / Joist Wth.	½○-⅝□ 4″	½□-⅝○ 4″	⅝○-⅝□ 4″	⅝○-¾○ 4″	2-¾○ 4½″	⅝□-¾□ 4½″	¾□-¾○ 4½″	¾□-⅞○ 5″	¾□-⅞□ 5″	⅞○-⅞□ 5″	$\frac{WL}{12}$
R. M. In ft. lbs.	4670	4960	5395	5710	6680	7200	7500	8500	9600	9760	R. M. In ft. lbs.
8	730	775									8
9	576	614	667								9
10	467	496	540	571	668						10
11	386	410	446	472	552	595	620				11
12	325	344	375	397	464	500	521	591			12
13	277	293	320	338	395	426	444	503			13
14	239	253	275	291	341	368	383	434	490	497	14
15	208	220	240	254	297	320	333	378	427	434	15
16	182	194	211	223	261	281	293	332	375	381	16
17	161	172	187	197	231	249	259	294	332	338	17
18	144	153	167	176	206	222	231	262	296	301	18
19	129	137	149	158	185	200	208	235	266	270	19
20	117	124	135	142	167	180	187	212	240	244	20
21	106	113	122	129	151	164	170	192	218	221	21
22	97	102	111	118	138	149	155	176	198	202	22
23	88	94	102	108	126	136	142	161	181	184	23
24	81	86	94	99	116	125	130	147	167	169	24
25	75	80	86	91	107	115	120	136	153	156	25
26	69	74	80	84	99	106	111	126	142	144	26
27		68	74	78	92	99	103	116	132	134	27
28					85	92	96	108	122	124	28
					79	85	89	101	114	116	29
					74	80	83	94	107	108	30

SPAN IN FEET

Table 22

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	10"
Core—Width	20"
Concrete Slab	4"
Steel @	16,000 #
Concrete @	650 #

Da... ...ists / ... to Center of Joists / Average Wt. Per Sq. Ft.				4" 24" 80.7 #		4½" 24½" 82.5 #	5" 25" 84.2 #	5½" 25½" 85.8 #			
Reinf. Joist Wth.	2-¾○ 4½"	⅝□-¾□ 4½"	¾○-⅞□ 4½"	2-¾□ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"	$\frac{WL}{8}$
Reinf. Joist Wth.	2-⅝□ 4½"	⅝□-¾○ 4½"	⅝□-¾□ 4½"	¾○-¾□ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	⅞□-⅞○ 5"	⅞□-1○ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	$\frac{WL}{9}$
Reinf. Joist Wth.	⅝□-⅝○ 4"	¾○-⅝○ 4"	¾○-⅝□ 4½"	2-¾○ 4½"	⅞○-¾○ 4½"	2-¾□ 4½"	2-⅞○ 5"	1○-⅞○ 5"	2-1○ 5"	1○-1□ 5"	$\frac{WL}{10}$
Reinf. Joist Wth.	½○-⅝□ 4"	½□-⅝○ 4"	⅝○-⅝□ 4"	⅝○-¾○ 4"	2-¾○ 4½"	⅝□-¾□ 4½"	¾□-¾○ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	$\frac{WL}{12}$
R. M. In ft. lbs.	5555	5930	6440	6810	7945	8580	8950	10190	11440	12950	R. M. In ft. lbs.
8	868										8
9	686	732	795	842							9
10	556	593	644	681	795						10
11	459	490	532	562	657	709	740				11
12	386	412	447	473	552	596	622	708			12
13	328	351	381	403	470	508	530	603	678		13
14	283	302	329	347	406	438	456	520	584		14
15	247	264	286	303	353	381	398	453	508	576	15
16	217	231	251	266	310	335	350	398	447	506	16
17	192	205	223	236	275	297	309	352	396	448	17
18	171	183	199	210	246	265	276	315	353	400	18
19	154	164	178	189	220	238	248	282	317	359	19
20	140	148	161	170	200	214	223	255	286	324	20
21	126	134	146	155	181	194	203	231	260	294	21
22	115	122	133	141	165	177	185	210	236	268	22
23	105	112	122	129	151	162	169	193	216	245	23
24	97	103	112	118	138	149	155	177	199	225	24
25	89	95	103	109	128	137	143	163	183	207	25
26	82	88	95	101	118	127	132	151	169	192	26
27	77	81	88	94	109	118	123	140	157	178	27
28	71	75	82	87	101	109	114	130	146	165	28
29	66	70	77	81	95	102	106	121	136	154	29
30		65	72	76	89	95	99	113	127	144	30

SPAN IN FEET

Core—Depth 12"
Core—Width 20"
Concrete Slab 4"
Steel @ 16,000 #
Concrete @ 650 #

Table 23

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data	Width of Joists Center to Center of Joists Average Wt. Per Sq. Ft.		4" 24" 88.0 #		4½" 24½" 90.2 #		5" 25" 92.2 #		5½" 25½" 94.2 #		
Reinf. Joist Wth.	2–¾□ 4½"	¾□–⅞□ 5"	2–⅞□ 5"	2–⅞□ 5"	⅞□–1□ 5"	2–1⅛○ 5½"	1⅛○–1⅛□ 5½"				W L / 8
Reinf. Joist Wth.	¾○–¾□ 4½"	¾□–⅞○ 4½"	¾□–⅞□ 5"	⅞□–⅞○ 5"	⅞□–1○ 5"	⅞□–1□ 5"	2–1⅛○ 5½"	1⅛○–1⅛□ 5½"	1⅛○–1⅛□ 5½"		W L / 9
Reinf. Joist Wth.	2–¾○ 4½"	⅞○–¾○ 4½"	2–¾□ 4½"	2–⅞○ 5"	1○–⅞○ 5"	2–1○ 5"	1○–1□ 5"	2–1□ 5"	1⅛□–1□ 5½"	2–1⅛□ 5½"	W L / 10
Reinf. Joist Wth.	⅝○–¾○ 4"	2–¾○ 4½"	⅝□–¾□ 4½"	¾□–¾○ 4½"	¾□–⅞○ 4½"	¾□–⅞□ 5"	2–⅞□ 5"	⅞□–1□ 5"	2–1⅛○ 5½"	1⅛○–1⅛□ 5½"	W L / 12
R. M. In ft. lbs.	7920	9250	10000	10380	11840	13350	15060	16800	18500	20500	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
10	792										10
11	654	764	827								11
12	550	642	695	720	822						12
13	468	547	592	614	701	789					13
14	404	472	510	529	604	681					14
15	352	412	445	462	526	594	669				15
16	309	361	391	406	463	522	588	656			16
17	273	319	346	359	410	462	521	580	640		17
18	244	287	309	321	366	412	465	519	571		18
19	219	257	277	288	328	370	417	465	513	568	19
20	198	232	250	260	296	334	377	420	462	513	20
21	179	210	227	236	269	303	342	381	420	465	21
22	163	192	207	215	245	276	312	348	382	423	22
23	149	175	189	197	224	253	285	318	350	388	23
24	137	161	174	181	206	232	262	292	321	356	24
25	127	149	160	167	190	214	241	269	296	328	25
26	117	137	148	154	176	198	223	249	274	303	26
27	109	128	137	143	163	184	207	231	254	281	27
28	101	119	128	133	151	170	193	215	236	262	28
29	94	111	119	124	141	159	179	200	220	244	29
30	88	104	111	116	132	149	167	187	206	228	30
31	82	97	104	108	123	139	156	175	193	213	31
		91	98	101	115	130	147	164	180	200	32

Table 24

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth			14"
Core—Width			20"
Concrete Slab			4"
Steel		@	16,000 #
Concrete		@	650 #

Width of Joists	4"	4½"	5"	5½"
Center of Joists	24"	24½"	25"	25½"
Average Wt. Per Sq. Ft.	95.8 #	98.2 #	100.6 #	102.8 #

Reinf. Joist Wth.	2-¾□ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"				W L / 8
Reinf. Joist Wth.	¾□-⅝○ 4½"	¾□-⅞○ 4½"	⅝□-⅞□ 5"	⅞□-⅞○ 5"	⅞□-1○ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"			W L / 9
Reinf. Joist Wth.	2-¾○ 4½"	⅞○-¾○ 4½"	2-¾□ 4½"	2-⅞○ 5"	1○-⅞○ 5"	2-1○ 5"	1○-1□ 5"	2-1□ 5"	1⅛□-1□ 5½"	2-1⅛□ 5½"	W L / 10
Reinf. Joist Wth.	⅝○-⅝○ 4"	2-¾○ 4½"	⅝□-¾□ 4½"	¾□-¾○ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"	W L / 12
R. M. In ft. lbs.	8990	10550	11390	11840	13500	15240	17280	19200	21150	24420	R. M. In ft. lbs.
SPAN IN FEET											**SPAN IN FEET**
10	899	1055									10
11	743	872	941								11
12	624	733	791	822	937						12
13	532	624	674	701	800	903					13
14	459	538	581	604	690	778					14
15	400	469	506	526	600	678	768				15
16	351	412	445	463	527	595	675	750			16
17	311	365	394	409	467	527	597	665	732		17
18	278	326	352	365	417	472	534	593	653		18
19	249	293	316	328	374	422	479	532	586	677	19
20	225	264	285	296	338	381	432	480	529	611	20
21	204	240	258	269	306	346	392	436	480	554	21
22	186	218	236	245	279	315	358	397	437	505	22
23	170	200	215	224	256	288	327	363	400	462	23
24	156	183	198	206	235	264	300	334	360	425	24
25	144	169	182	190	216	244	276	308	339	391	25
26	133	156	169	175	200	225	256	284	315	362	26
27	123	145	156	163	186	209	237	264	290	336	27
28	115	135	145	151	173	194	220	245	270	312	28
29	107	126	136	141	161	181	206	228	252	290	29
30	100	117	127	132	150	169	192	214	235	272	30
31	94	110	119	123	141	158	180	200	220	254	31
32	88	103	111	116	132	148	169	187	207	238	32

Core—Depth		**4″**
Core—Width		**20″**
Concrete Slab		**2″**
Steel	**@**	**18,000 #**
Concrete	**@**	**650 #**

Table 25

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data											
Width of Joists	4″					4½″					
Center to Center of Joists	24″					24½″					
Average Wt. Per Sq. Ft.	37.9 #					38.6 #					
Reinf. Joist Wth.	2–½□ 4″	2–½□ 4″	½□–⅝○ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	2–⅝□ 4½″	2–¾○ 4½″	⅝□–¾□ 4½″			$\frac{WL}{8}$
Reinf. Joist Wth.	½□–½○ 4″	½○–½□ 4″	2–½□ 4″	½□–⅝○ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	2–⅝□ 4½″	⅝□–¾○ 4½″			$\frac{WL}{9}$
Reinf. Joist Wth.	½□–⅝○ 4″	2–½○ 4″	½□–½○ 4″	2–½□ 4″	⅝○–½□ 4″	2–⅝○ 4″	⅝○–⅝□ 4″	¾○–⅝○ 4″			$\frac{WL}{10}$
Reinf. Joist Wth.	⅜○–½○ 4″	⅜□–½○ 4″	⅜□–½□ 4″	½○–½□ 4″	2–½□ 4″	½□–⅝○ 4″	½○–⅝□ 4″	½□–⅝□ 4″			$\frac{WL}{12}$
R. M. In ft. lbs.	1230	1327	1500	1675	1830	2000	2120	2130			R. M. In ft. lbs.
SPAN IN FEET 6	342										6
7	251	271	306	342							7
8	192	207	234	262	286						8
9	152	164	185	207	226	247	262	263			9
10	123	133	150	167	183	200	212	213			10
11	102	110	124	138	151	165	175	176			11
12	86	92	104	116	127	139	147	148			12
13	73	79	89	99	108	118	125	126			13
14	63	68	77	85	94	102	108	109			14
15		59	67	74	81	89	94	95			15
16				66	72	78	83	83			16
17					63	69	74	74			17
18						62	66	66			18
19								59			19 SPAN IN FEET

Table 26

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	6″
Core—Width	20″
Concrete Slab	2″
Steel @	18,000 #
Concrete @	650 #

Data	Joists									
Center to Center of Joists Average Wt. Per Sq. Ft.				4″ 24″ 43.9 #		4½″ 24½″ 44.8 #	5″ 25″ 45.9 #			
Reinf. Joist Wth.	2–½□ 4″	½□–⅝○ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	2–⅝□ 4½″	2–¾○ 4½″	⅝□–¾□ 4½″	2–¾□ 4½″	¾□–¾□ 5″	$\frac{WL}{8}$
Reinf. Joist Wth.	½○–½□ 4″	2–½□ 4″	½□–⅝○ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	2–⅝□ 4″	⅝□–¾○ 4½″	¾○–¾□ 4½″	¾□–¾○ 4½″	$\frac{WL}{9}$
Reinf. Joist Wth.	2–½○ 4″	½○–½□ 4″	2–½□ 4″	⅝○–½□ 4″	2–⅝○ 4″	⅝○–⅝□ 4″	¾○–⅝○ 4″	2–¾○ 4½″	⅞○–¾○ 4½″	$\frac{WL}{10}$
Reinf. Joist Wth.	⅝□–½○ 4″	⅝□–½□ 4″	½○–½□ 4″	2–½□ 4″	½○–⅝○ 4″	½○–⅝□ 4″	½□–⅝□ 4″	⅝○–¾○ 4″	2–¾○ 4½″	$\frac{WL}{12}$
R. M. In ft. lbs.	1915	2150	2400	2640	2885	3270	3460	3980	4580	R. M. In ft. lbs.
SPAN IN FEET										SPAN IN FEET
7	391	439	490	539						7
8	299	336	375	413	450					8
9	237	266	296	326	356	405				9
10	192	215	240	264	289	328	346			10
11	158	178	198	218	238	271	286	329		11
12	133	149	166	183	200	228	240	276	318	12
13	113	127	142	156	171	194	205	236	271	13
14	98	110	122	135	147	167	177	203	234	14
15	85	96	107	117	128	146	154	177	204	15
16	75	84	94	103	113	128	135	155	179	16
17	66	75	83	91	100	113	120	138	159	17
18		66	74	82	89	101	107	123	141	18
19			66	73	80	91	96	110	127	19
20				66	72	82	87	100	115	20
21					66	75	79	90	104	21
22						68	72	82	95	22
23							66	75	87	23
24								69	80	24
25									73	25

ore—Depth		8″
ore—Width		20″
oncrete Slab		2″
eel	@	18,000 #
oncrete	@	650 #

Table 27

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data	Center to Center of Joists / Average Wt. Per Sq. Ft.			24″ 50.1 #		24½″ 51.5 #	25″ 52.9 #				
Reinf. Joist Wth.	2-5/8 □ 4½″	2-3/4 ○ 4½″	5/8 □-3/4 □ 4½″	3/4 ○-7/8 ○ 4½″	2-3/4 □ 4½″	3/4 □-7/8 □ 5″	2-7/8 □ 5″	2-7/8 □ 5″	1 □-7/8 □ 5″		W L / 8
Reinf. Joist Wth.	5/8 ○-5/8 □ 4″	2-5/8 □ 4½″	3/4 ○-5/8 □ 4½″	5/8 □-3/4 □ 4½″	3/4 □-3/4 ○ 4½″	3/4 □-7/8 ○ 4½″	3/4 □-7/8 □ 5″	7/8 □-7/8 ○ 5″	7/8 □-1 ○ 5″		W L / 9
Reinf. Joist Wth.	2-5/8 ○ 4″	5/8 □-5/8 ○ 4″	3/4 ○-5/8 ○ 4″	3/4 ○-5/8 □ 4½″	2-3/4 ○ 4½″	7/8 ○-3/4 ○ 4½″	2-3/4 □ 4½″	2-7/8 ○ 5″	1 ○-7/8 ○ 5″		W L / 10
Reinf. Joist Wth.	1/2 ○-5/8 ○ 4″	1/2 ○-5/8 □ 4″	1/2 □-5/8 ○ 4″	5/8 ○-5/8 □ 4″	5/8 ○-3/4 ○ 4″	2-3/4 ○ 4½″	5/8 □-3/4 □ 4½″	3/4 □-3/4 ○ 4½″	3/4 □-7/8 ○ 4½″		W L / 12
R. M. In ft. lbs.	3740	4230	4510	4900	5180	6050	6550	6780	7710		R. M. In ft. lbs.
8	584	661									8
9	462	522	557	606							9
10	374	423	451	490	518						10
11	309	349	373	405	428	500					11
12	260	294	313	340	360	420		471			12
13	221	250	268	290	307	358	388	401			13
14	191	216	230	250	264	309	334	346	393		14
15	166	188	200	218	230	269	291	301	342		15
16	146	165	176	192	202	236	256	265	301		16
17	130	146	156	170	179	209	226	235	267		17
18	115	131	139	151	160	187	202	209	238		18
19	104	117	125	136	144	168	181	188	214		19
20	94	106	113	123	130	151	164	170	193		20
21	85	96	102	111	117	137	148	154	175		21
22	77	88	93	101	107	125	135	140	160		22
23	71	80	85	93	98	114	124	128	146		23
24	65	73	78	85	90	105	114	118	134		24
25		68	72	79	83	97	105	109	123		25
26			67	73	77	90	97	100	114		26
27				67	71	83	90	93	106		27
28					66	77	84	87	98		28
29						72	78	81	92		29
							73	75	86		30

SPAN IN FEET

Table 28

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	10"
Core—Width	20"
Concrete Slab	2"
Steel @	18,000 #
Concrete @	650 #

Data	Center to Center of Joists / Average Wt. Per Sq. Ft.			4" 24" 56.7 #		4½" 24½" 58.5 #	5" 25" 60.2 #	5½" 25½" 61.8 #			
Reinf. Joist Wth.	2–⅝□ 4½"	2–¾○ 4½"	⅝□–¾□ 4½"	¾○–⅞○ 4½"	2–¾□ 4½"	¾□–⅝□ 5"	2–⅞□ 5"	2–⅞□ 5"	⅞□–1□ 5"	2–1⅛○ 5½"	$\frac{WL}{8}$
Reinf. Joist Wth.	⅝○–⅝□ 4"	2–⅝□ 4½"	⅝□–¾○ 4½"	⅝□–¾□ 4½"	¾○–¾□ 4½"	¾□–⅞○ 4½"	¾□–⅞□ 5"	⅞□–⅞○ 5"	⅞□–1○ 5"	⅞□–1□ 5"	$\frac{WL}{9}$
Reinf. Joist Wth.	2–⅝○ 4"	⅝□–⅝○ 4"	¾○–⅝○ 4"	¾○–⅝□ 4½"	2–¾○ 4½"	⅞○–¾○ 4½"	2–¾□ 4½"	2–⅞○ 5"	1○–⅞○ 5"	2–1○ 5"	$\frac{WL}{10}$
Reinf. Joist Wth.	½○–⅝○ 4"	½○–⅝□ 4"	½□–⅝○ 4"	⅝○–⅝□ 4"	⅝○–¾○ 4"	2–¾○ 4½"	⅝□–¾□ 4½"	¾□–¾○ 4½"	¾□–⅞○ 4½"	¾□–⅞□ 5"	$\frac{WL}{12}$
R. M. In ft. lbs.	4650	5250	5580	6060	6420	7480	8125	8420	9560	10800	R. M. In ft. lbs.
SPAN IN FEET 8	727										8
9	574	650	688	749							9
10	465	525	558	606	642						10
11	384	434	461	501	530	618					11
12	323	365	388	421	446	520	565	585			12
13	275	311	330	359	380	443	481	498	565		13
14	237	268	285	310	328	382	415	430	488		14
15	207	233	248	270	285	332	361	374	425		15
16	182	205	218	237	251	292	317	329	374	422	16
17	161	182	193	210	222	259	281	292	331	374	17
18	144	162	172	187	198	231	251	260	295	333	18
19	129	145	155	168	178	207	225	233	265	299	19
20	116	131	140	152	161	187	203	210	239	270	20
21	105	119	126	138	146	169	184	191	216	245	21
22	96	108	115	126	133	155	168	174	198	223	22
23	88	99	105	115	121	141	154	159	181	204	23
24	81	91	97	105	111	130	141	146	166	187	24
25	74	84	89	97	103	120	130	135	153	173	25
26	69	78	83	90	95	110	120	125	141	160	26
27	64	72	77	83	88	102	112	116	131	148	27
28		67	71	78	82	95	104	107	122	138	28
29				72	76	89	97	100	114	128	29
30					71	83	90	94	106	120	30
31								88	100	112	31 **SPAN IN FEET**

Core—Depth 12"
Core—Width 20"
Concrete Slab 2"
Steel @ 18,000 #
Concrete @ 650 #

Table 29

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data											
Width of Joists / Center to Center of Joists / Average Wt. Per Sq. Ft.				4" / 24" / 64.0 #		4½" / 24½" / 66.2 #	5" / 25" / 68.2 #	5½" / 25½" / 70.2 #			
Reinf. Joist Wth.	2-¾ ○ 4½"	⅝ □-¾ □ 4½"	2-¾ □ 4½"	¾ □-⅞ □ 5"	2-⅞ □ 5"	2-⅞ □ 5"	⅞ □-1 □ 5"	2-1⅛ ○ 5½"	1⅛ ○-1⅛ □ 5½"		W L / 8
Reinf. Joist Wth.	2-⅝ □ 4½"	⅝ □-¾ ○ 4½"	¾ ○-¾ □ 4½"	¾ □-⅞ ○ 4½"	¾ □-⅞ □ 5"	⅞ □-⅞ ○ 5"	⅞ □-1 ○ 5"	⅞ □-1 □ 5"	2-1⅛ ○ 5½"	1⅛ ○-1⅛ □ 5½"	W L / 9
Reinf. Joist Wth.	⅝ □-⅝ ○ 4"	¾ ○-⅝ ○ 4"	2-¾ ○ 4½"	⅞ ○-¾ ○ 4½"	2-¾ □ 4½"	2-⅞ ○ 5"	1 ○-⅞ ○ 5"	2-1 ○ 5"	1 ○-1 □ 5"	2-1 □ 5"	W L / 10
Reinf. Joist Wth.	½ ○-⅝ □ 4"	½ □-⅝ ○ 4"	⅝ ○-¾ ○ 4"	2-¾ ○ 4½"	⅝ □-¾ □ 4½"	¾ □-¾ ○ 4½"	¾ □-⅞ ○ 4½"	¾ □-⅞ □ 5"	2-⅞ □ 5"	⅞ □-1 □ 5"	W L # / 12
R. M. In ft. lbs.	6270	6700	7630	8950	9680	10080	11440	12880	14560	16200	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
10	627	670	763								10
11	518	554	631	738							11
12	435	465	530	622	672	700					12
13	371	397	452	530	572	600	678				13
14	320	342	389	456	496	514	584				14
15	279	298	339	398	430	448	508	572			15
16	245	262	298	350	378	394	447	503			16
17	217	232	264	310	335	349	396	446	504		17
18	193	207	235	276	299	311	353	397	450		18
19	174	185	211	248	268	279	317	357	404	449	19
20	157	167	191	224	242	252	286	322	364	405	20
21	142	152	173	203	219	228	260	292	330	367	21
22	130	138	158	185	200	208	237	266	301	335	22
23	118	127	144	169	183	191	216	244	275	306	23
24	109	116	132	155	168	175	199	224	253	281	24
25	100	107	122	143	155	161	183	206	233	260	25
26	93	99	113	132	143	149	169	190	216	240	26
27	86	92	105	123	133	138	157	177	200	223	27
28	80	86	97	114	123	129	146	164	186	207	28
29	75	80	91	106	115	120	136	153	173	192	29
30	70	74	85	100	108	112	127	143	162	180	30
					100		119	134	152	169	31

Table 30

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth		**14"**
Core—Width		**20"**
Concrete Slab		**2"**
Steel	@	**18,000 #**
Concrete	@	**650 #**

Data	...ts	4"	4½"	5"	5½"
...nter of Joists		24"	24½"	25"	25½"
Average Wt. Per Sq. Ft.		71.8 #	74.2 #	76.6 #	78.8 #

Reinf. Joist Wth.	2-¾□ 4½"	¾□-⅞□ 4½"	2-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"				W L 8
Reinf. Joist Wth.	¾○-¾□ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	⅞□-⅞○ 5"	⅞□-1○ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"			W L 9
Reinf. Joist Wth.	2-¾○ 4½"	⅞○-⅞○ 4½"	2-¾□ 4½"	2-⅞○ 5"	1○-⅞○ 5"	2-1○ 5"	1○-1□ 5"	2-1□ 5"	1⅛□-1□ 5½"	2-1⅛□ 5½"	W L 10
Reinf. Joist Wth.	⅝○-¾○ 4"	2-⅞○ 4½"	⅝□-¾□ 4½"	¾□-¾○ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"	W L 12
R. M. In ft. lbs.	8900	10400	11220	11680	13360	15040	17000	18900	20820	22250	R. M. In ft. lbs
SPAN IN FEET											SPAN IN FEET
10	890										10
11	736	859	927	965							11
12	618	723	779	811							12
13	527	616	664	694	791						13
14	454	531	572	595	682						14
15	395	463	500	519	594	669					15
16	348	406	438	456	522	588					16
17	308	360	388	405	462	520	588				17
18	275	321	346	360	413	465	525				18
19	247	288	311	324	370	417	471	524	576		19
20	222	260	281	292	334	376	425	473	520		20
21	202	236	254	265	303	341	386	429	472	502	21
22	184	215	232	242	276	312	352	391	431	460	22
23	168	197	212	221	253	285	322	358	395	421	23
24	154	181	195	202	232	261	295	328	362	386	24
25	142	166	180	187	214	241	272	303	334	356	25
26	132	154	166	173	198	223	252	280	308	329	26
27	122	143	154	160	183	206	234	260	286	305	27
28	113	133	143	149	170	192	217	241	266	284	28
29	106	123	133	139	159	179	202	225	248	264	29
30	99	116	125	130	149	167	189	210	232	247	30
31	93	108	117	122	139	157	177	196	217	231	31
32									203	217	32

Core—Depth 4"
Core—Width 20"
Concrete Slab 2½"
Steel @ 18,000 #
Concrete @ 650 #

Table 31

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data											
Width of Joists	4"					4½"					
Center to Center of Joists	24"					24½"					
Average Wt. Per Sq. Ft.	43.9 #					44.5 #					
Reinf. / Joist Wth.	2-½□ / 4"	2-½□ / 4"	½□-⅝○ / 4"	½□-⅝□ / 4"	⅝○-⅝□ / 4"	2-⅝□ / 4½"	2-¾○ / 4½"	⅝□-¾□ / 4½"			W L / 8
Reinf. / Joist Wth.	½□-½○ / 4"	½○-½□ / 4"	2-½□ / 4"	½□-⅝○ / 4"	½□-⅝□ / 4"	⅝○-⅝□ / 4"	2-⅝□ / 4½"	⅝□-¾○ / 4½"			W L / 9
Reinf. / Joist Wth.	½□-⅝○ / 4"	2-½○ / 4"	½□-½○ / 4"	2-½□ / 4"	⅝○-½□ / 4"	2-⅝○ / 4"	⅝○-⅝□ / 4"	¾○-⅝○ / 4"			W L / 10
Reinf. / Joist Wth.	⅝○-½○ / 4"	⅝□-½○ / 4"	⅝□-½□ / 4"	½○-½□ / 4"	2-½□ / 4"	½□-⅝○ / 4"	½○-⅝□ / 4"	½□-⅝□ / 4"			W L / 12
R. M. In ft. lbs.	1350	1470	1660	1850	2025	2215	2480	2500			R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
6	375										6
7	276	300	339	378							7
8	211	230	260	290	316	346					8
9	167	182	205	229	250	274	306				9
10	135	147	166	185	203	222	248	250			10
11	112	122	137	153	168	183	205	207			11
12	94	102	115	129	141	154	172	174			12
13	80	87	98	110	120	131	147	148			13
14	69	75	85	95	103	113	127	128			14
15	60	65	74	82	90	99	110	111			15
16		58	65	72	79	87	97	98			16
17			58	64	70	77	86	87			17
18					63	69	77	77			18
19						62	69	69			19
20							62	63			20

Table 32

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth		6″
Core—Width		20″
Concrete Slab		2½″
Steel	@	18,000 #
Concrete	@	650 #

Data											
Width of Joists	4″				4½″			5″			
Center to Center of Joists	24″				24½″			25″			
Average Wt. Per Sq. Ft.	49.9 #				50.9 #			51.9 #			
Reinf. / Joist Wth.	½□–½○ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	2–⅝□ 4½″	2–¾○ 4½″	⅝□–¾□ 4½″	¾○–¾□ 4½″	2–¾□ 4½″	¾□–⅞□ 5″	2–⅞□ 5″	W L / 8
Reinf. / Joist Wth.	2–½□ 4″	½□–½○ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	2–⅝□ 4½″	⅝□–¾○ 4½″	⅝○–¾□ 4½″	¾○–¾□ 4½″	¾□–⅞○ 4½″	¾□–⅞□ 5″	W L / 9
Reinf. / Joist Wth.	½□–½○ 4″	2–½□ 4″	⅝○–½□ 4″	2–⅝○ 4″	⅝□–⅝○ 4″	¾○–⅝○ 4″	2–⅝□ 4½″	2–¾○ 4½″	⅞○–¾○ 4½″	2–¾□ 4½″	W L / 10
Reinf. / Joist Wth.	⅝□–½□ 4″	½○–½□ 4″	2–½□ 4″	½○–⅝○ 4″	½○–⅝□ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	⅝○–¾○ 4″	2–¾○ 4½″	⅝□–¾□ 4½″	W L / 12
R. M. In ft. lbs.	2310	2580	2830	3100	3510	3730	3850	4280	4975	5390	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
7	472	527									7
8	361	404	442	485							8
9	285	319	350	383	434		476				9
10	231	258	283	310	351	373	385	428			10
11	191	213	234	256	290	308	318	354			11
12	161	179	197	215	244	259	268	297	346		12
13	137	153	168	184	208	221	228	253	294	320	13
14	118	132	144	158	179	190	197	218	254	275	14
15	103	115	126	138	156	166	171	190	221	240	15
16	90	101	110	121	137	146	151	167	194	211	16
17	80	89	98	107	121	129	133	148	172	187	17
18	71	80	87	96	108	115	119	132	153	167	18
19	64	72	78	86	98	103	107	118	138	149	19
20		65	71	78	88	93	97	107	124	135	20
21			64	71	80	85	88	97	113	122	21
22				65	73	77	80	89	103	111	22

Core—Depth 8"
Core—Width 20"
Concrete Slab 2½"
Steel @ 18,000 #
Concrete @ 650 #

Table 33

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data	Width of Joists / Center to Center of Joists / Average Wt. Per Sq. Ft.			4" 24" 56.1 #		4½" 24½" 57.5 #	5" 25" 58.9 #				
Reinf. Joist Wth.	2-⅝□ 4½"	2-¾○ 4½"	⅝□-¾□ 4½"	¾○-⅞○ 4½"	2-¾□ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	2-⅞□ 5"	1□-⅞□ 5"		W L / 8
Reinf. Joist Wth.	⅝○-⅝□ 4"	2-⅝□ 4½"	¾○-⅝□ 4½"	⅝□-¾□ 4½"	¾□-¾○ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	⅞□-⅞○ 5"	⅞□-1○ 5"		W L / 9
Reinf. Joist Wth.	2-⅝○ 4"	⅝□-⅝○ 4"	¾○-⅝○ 4"	¾○-⅝□ 4½"	2-¾○ 4½"	⅞○-¾○ 4½"	2-¾□ 4½"	2-⅞○ 5"	1○-⅞○ 5"		W L / 10
Reinf. Joist Wth.	½○-⅝○ 4"	½○-⅝□ 4"	½□-⅝○ 4"	⅝○-⅝□ 4"	⅝○-¾○ 4"	2-¾○ 4½"	⅞□-¾□ 4½"	¾□-¾○ 4½"	¾□-⅞○ 4½"		W L / 12
R. M. In ft. lbs.	3975	4490	4790	5220	5500	6400	6920	7200	8170		R. M. In ft. lbs.
SPAN IN FEET											**SPAN IN FEET**
8	621										8
9	491	555	592	644							9
10	398	449	479	522	550						10
11	329	371	396	431	454						11
12	276	312	332	362	382	444	481	500			12
13	235	266	283	308	325	379	409	426			13
14	203	229	244	266	280	326	353	368	417		14
15	177	200	213	232	244	284	308	320	363		15
16	155	175	187	204	215	250	270	281	319		16
17	137	155	165	181	190	221	239	249	283		17
18	123	139	148	161	170	197	214	222	252		18
19	110	124	133	145	152	177	192	199	226		19
20	100	112	120	131	137	160	173	180	204		20
21	90	102	109	118	125	145	157	163	185		21
22	82	93	99	108	114	132	143	149	169		22
23	75	85	90	99	104	121	131	136	154		23
24	69	78	83	91	95	111	120	125	142		24
25	64	72	77	83	88	102	111	115	131		25
26		66	71	77	81	95	102	106	121		26
27		62	66	72	75	88	95	99	112		27
28			61	67	70	82	88	92	103		28
29				62	65	76	82	86	97		29
					61	71	77	80	91		30

Table 34

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	10"
Core—Width	20"
Concrete Slab	2½"
Steel @	18,000 #
Concrete @	650 #

D.... Center to center of Joists / Average Wt. Per Sq. Ft.				4" 24" 62.7 #		4½" 24½" 64.5 #	5" 25" 66.2 #	5½" 25½" 67.8 #			
Reinf. Joist Wth.	2-¾○ 4½"	⅝□-¾□ 4½"	¾○-⅞○ 4½"	2-¾□ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"	$\frac{WL}{8}$
Reinf. Joist Wth.	2-⅝□ 4½"	⅝□-¾○ 4½"	⅝□-¾□ 4½"	¾○-¾□ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	⅞□-⅞○ 5"	⅞□-1○ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	$\frac{WL}{9}$
Reinf. Joist Wth.	⅝□-⅝○ 4"	¾○-⅝○ 4"	¾○-⅝□ 4½"	2-¾○ 4½"	⅞○-¾○ 4½"	2-¾□ 4½"	2-⅞○ 5"	1○-⅞○ 5"	2-1○ 5"	1○-1□ 5"	$\frac{WL}{10}$
Reinf. Joist Wth.	½○-⅝□ 4"	½□-⅝○ 4"	⅝○-⅝□ 4"	⅝○-¾○ 4"	2-¾○ 4½"	⅝□-¾□ 4½"	¾□-¾○ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	$\frac{WL}{12}$
R. M. In ft. lbs.	5500	5840	6360	6725	7860	8520	8860	10020	11300	12750	R. M. In ft. lbs.
8	860										8
9	678	722	785								9
10	550	584	636	673							10
11	454	483	526	556	650						11
12	382	405	442	467	546	592	615				12
13	325	345	376	398	465	504	524				13
14	280	298	324	343	401	434	452	512			14
15	244	260	283	299	350	378	394	445	502		15
16	215	228	248	263	307	332	346	392	441		16
17	190	202	220	233	272	294	306	346	391	441	17
18	170	180	196	207	243	263	274	309	349	393	18
19	152	162	176	186	218	236	246	278	313	353	19
20	137	146	159	168	196	213	222	251	282	319	20
21	125	133	144	153	178	193	201	227	256	289	21
22	114	120	131	139	162	176	183	207	233	263	22
23	104	110	120	127	149	161	167	189	214	241	23
24	95	101	110	117	137	148	154	174	196	222	24
25	88	94	102	108	126	136	142	160	181	204	25
26	81	86	94	100	116	126	131	148	167	188	26
27	75	80	87	92	108	117	122	138	155	175	27
28	70	75	81	86	100	108	113	128	144	162	28
29	65	70	76	80	94	101	105	119	134	152	29
30		65	71	75	87	95	98	111	125	142	30
SPAN IN FEET											SPAN IN FEET

Core—Depth 12"
Core—Width 20"
Concrete Slab 2½"
Steel @ 18,000 #
Concrete @ 650 #

Table 35

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data	Width of Joists / Center to Center of Joists / Average Wt. Per Sq. Ft.			4" / 24" / 70.0 #		4½" / 24½" / 72.2 #	5" / 25" / 74.2 #	5½" / 25½" / 76.2 #			
Reinf. Joist Wth.	2-¾ ○ 4½"	⅝ □-¾ □ 4½"	2-¾ □ 4½"	¾ □-⅞ □ 5"	2-⅞ □ 5"	2-⅞ □ 5"	⅞ □-1 □ 5"	2-1⅛ ○ 5½"	1⅛ ○ 1⅛ □ 5½"		W L / 8
Reinf. Joist Wth.	2-⅝ □ 4½"	⅝ □-¾ ○ 4½"	¾ ○-¾ □ 4½"	¾ □-⅞ ○ 4½"	¾ □-⅞ □ 5"	⅞ □-⅞ ○ 5"	⅞ □-1 ○ 5"	⅞ □-1 □ 5"	2-1⅛ ○ 5½"	1⅛ ○-1⅛ □ 5½"	W L / 9
Reinf. Joist Wth.	⅝ □-⅝ ○ 4"	¾ ○-⅝ ○ 4"	2-¾ ○ 4½"	⅞ ○-¾ ○ 4½"	2-¾ □ 4½"	2-⅞ ○ 5"	1 ○-⅞ ○ 5"	2-1 ○ 5"	1 ○-1 □ 5"	2-1 □ 5"	W L / 10
Reinf. Joist Wth.	½ ○-⅝ □ 4"	½ □-⅝ ○ 4"	⅝ ○-¾ ○ 4"	2-¾ ○ 4½"	⅝ □-¾ □ 4½"	¾ □-¾ ○ 4½"	¾ □-⅞ ○ 4½"	¾ □-⅞ □ 5"	2-⅞ □ 5"	⅞ □-1 □ 5"	W L / 12
R. M. In ft. lbs.	6510	6940	7960	9310	10050	10480	11925	13440	15160	16880	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
8	1015										8
9	804	857									9
10	651	694	796								10
11	538	574	658	770		866					11
12	452	482	553	646	698	728					12
13	385	410	471	550	595	620	706				13
14	332	354	406	475	513	535	608				14
15	289	309	354	414	447	466	530	597			15
16	254	271	311	364	393	410	466	525			16
17	225	240	275	322	348	363	412	465	524		17
18	201	215	246	287	311	324	368	415	468		18
19	181	192	220	258	279	290	330	373	420	468	19
20	163	174	199	233	252	262	298	336	379	422	20
21	148	157	181	211	228	238	271	305	344	383	21
22	135	143	164	192	208	217	247	278	314	349	22
23	123	131	150	176	190	198	226	254	287	319	23
24	113	120	138	162	175	182	207	234	263	293	24
25	104	111	127	149	161	168	191	215	243	270	25
26	96	102	118	138	149	155	177	199	224	250	26
27	89	95	109	128	138	144	164	184	208	232	27
28	83	89	102	119	128	134	152	172	193	215	28
29	77	83	95	111	120	125	142	160	180	201	29
			89	103	112	117	133	149	168	187	30

Table 36

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth			14"
Core—Width			20"
Concrete Slab			2½"
Steel	@		18,000 #
Concrete	@		650 #

Depth of Joists	4"	4½"	5"	5½"	6"
Width of Joists	24"	24½"	25"	25½"	26"
Average Wt. Per Sq. Ft.	77.8 #	80.2 #	82.6 #	84.8 #	87.0 #

Reinf. / Joist Wth.	2-¾□ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"				W L / 8
Reinf. / Joist Wth.	¾○-¾□ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	⅞□-⅞○ 5"	⅞□-1○ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"			W L / 9
Reinf. / Joist Wth.	2-¾○ 4½"	⅞○-¾○ 4½"	2-¾□ 4½"	2-⅞○ 5"	1○-⅞○ 5"	2-1○ 5"	1○-1□ 5"	2-1□ 5"	1⅛□-1□ 5½"	2-1⅛□ 5½"	W L / 10
Reinf. / Joist Wth.	¾○-¾○ 4"	2-¾○ 4½"	⅝□-¾□ 4½"	¾□-¾○ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"	W L / 12
R. M. In ft. lbs.	9200	10720	11610	12100	13830	15600	17580	19600	21500	23450	R. M. In ft. lbs.
SPAN IN FEET 10	920										10 SPAN IN FEET
11	760	886	960	1000							11
12	638	744	807	840							12
13	544	634	687	716	818						13
14	469	547	593	617	706	796					14
15	408	477	516	538	615	694					15
16	359	419	454	473	541	610	687				16
17	318	371	402	419	478	539	608				17
18	284	331	359	373	427	482	543	605			18
19	255	297	322	335	384	432	487	543	596		19
20	230	268	291	303	346	390	440	490	538	587	20
21	209	243	264	274	314	354	398	444	488	532	21
22	190	222	240	250	286	322	363	405	444	485	22
23	174	203	220	228	261	295	332	371	407	441	23
24	160	186	202	210	240	271	306	340	373	407	24
25	147	172	186	194	221	250	281	313	344	376	25
26	136	159	172	179	205	231	260	290	318	347	26
27	126	147	159	166	190	214	241	269	295	322	27
28	117	137	148	154	176	199	224	250	274	299	28
29	109	127	138	144	165	186	209	233	255	279	29
30	102	119	129	134	154	173	195	218	239	261	30
31	96	112	121	126	144	162	183	204	224	244	31
32	90	104	113	118	135	152	172	191	210	229	32

—Depth 4″
—Width 20″
crete Slab 3″
l @ 18,000 #
crete @ 650 #

Table 37

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data											
Width of Joists	4″					4½″					
Center to Center of Joists	24″					24½″					
Average Wt. Per Sq. Ft.	49.9 #					50.6 #					
Reinf. Joist Wth.	2-½□ 4″	2-½□ 4″	½□-⅝○ 4″	½□-⅝□ 4″	⅝○-⅝□ 4″	2-⅝□ 4½″	2-¾○ 4½″	⅝□-¾□ 4½″			W L / 8
Reinf. Joist Wth.	½□-½○ 4″	½○-⅝□ 4″	2-½□ 4″	½□-⅝○ 4″	½□-⅝□ 4″	⅝○-⅝□ 4″	2-⅝□ 4½″	⅝□-¾○ 4½″			W L / 9
Reinf. Joist Wth.	½□-⅝○ 4″	2-½○ 4″	½□-½○ 4″	2-½□ 4″	⅝○-½□ 4″	2-⅝○ 4″	⅝○-⅝□ 4″	¾○-⅝○ 4″			W L / 10
Reinf. Joist Wth.	⅝○-⅝○ 4″	⅝□-½○ 4″	⅝□-½□ 4″	½○-½□ 4″	2-½□ 4″	½□-⅝○ 4″	½○-⅝□ 4″	½□-⅝□ 4″			W L / 12
R. M. In ft. lbs.	1485	1610	1825	2030	2220	2435	2740	2900			R. M. In ft. lbs.
SPAN IN FEET 6	413										6
7	303	329	373	415							7
8	232	252	285	317	347	381					8
9	184	199	225	251	274	301	338				9
10	149	161	183	203	222	244	274	290			10
11	123	133	151	168	184	201	226	240			11
12	103	112	127	141	154	169	190	201			12
13	88	96	108	120	131	144	162	171			13
14	76	83	93	103	113	124	140	148			14
15	66	72	81	90	99	108	122	129			15
16	58	63	71	79	87	95	107	113			16
17			63	70	77	84	95	100			17
18				63	69	75	85	90			18
19					62	67	76	80			19
20						61	69	73			20
21							62	66			21
22								60			22 SPAN IN FEET

Table 38

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth		6″
Core—Width		20″
Concrete Slab		3″
Steel	@	18,000 #
Concrete	@	650 #

..ta										
Cente… …er of Joists / Average Wt. Per Sq. Ft.				4″ 24″ 55.9 #		4½″ 24½″ 57.0 #	5″ 25″ 57.9 #			
Reinf. Joist Wth.	½□–⅝○ 4″	½□–⅝□ 4″	⅝□–⅝○ 4″	2–⅝□ 4½″	2–¾○ 4½″	⅝□–¾□ 4½″	2–¾□ 4½″	2–¾□ 4½″	¾□–⅞□ 4½″	2–⅞□ 5″	W L / 8
Reinf. Joist Wth.	2–½□ 4″	½□–⅝○ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	2–⅝□ 4½″	⅝□–¾○ 4½″	⅝○–¾□ 4½″	¾○–¾□ 4½″	¾□–⅞○ 4½″	¾□–⅞□ 5″	W L / 9
Reinf. Joist Wth.	½□–½○ 4″	2–½□ 4″	⅝○–½□ 4″	2–⅝○ 4″	⅝□–⅝○ 4″	¾○–⅝○ 4″	2–⅝□ 4½″	2–¾○ 4½″	⅞○–¾○ 4½″	2–¾□ 4½″	W L / 10
Reinf. Joist Wth.	⅜□–½□ 4″	½○–½□ 4″	2–½□ 4″	½○–⅝○ 4″	½○–⅝□ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	⅝○–¾○ 4″	2–¾○ 4½″	⅝□–¾□ 4½″	W L / 12
R. M. In ft. lbs.	2470	2760	3030	3340	3770	3990	4125	4580	5320	5760	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
7	504	564									7
8	386	431	473	522							8
9	305	341	374	412	466		509				9
10	247	276	303	334	377	399	413	458			10
11	204	228	250	276	311	329	341	378			11
12	171	192	210	232	262	277	287	318	369		12
13	146	163	179	198	223	236	244	271	315	340	13
14	126	141	155	170	192	204	210	234	271	293	14
15	110	123	135	148	168	177	183	204	236	256	15
16	97	108	118	131	148	156	161	179	208	225	16
17	86	95	105	115	131	138	143	158	184	199	17
18	77	85	94	103	117	123	127	141	164	178	18
19	69	76	84	93	105	111	114	127	147	160	19
20	62	69	76	83	95	100	103	114	133	144	20
21		63	69	76	86	91	94	104	121	131	21
22			63	69	78	83	85	95	110	119	22
23				63	72	76	78	87	101	109	23
24					65	69	72	80	93	100	24
25							66	73	85	92	25
26								68	79	85	26

Core—Depth	**8″**
Core—Width	**20″**
Concrete Slab	**3″**
Steel @	**18,000 #**
Concrete @	**650 #**

Table 39

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data				
Width of Joists	4″	4½″	5″	5½″
Center to Center of Joists	24″	24½″	25″	25½″
Average Wt. Per Sq. Ft.	62.1 #	63.5 #	64.9 #	66.2 #

Reinf. Joist Wth.	2–5/8□ 4½″	2–3/4○ 4½″	5/8□–3/4□ 4½″	3/4○–7/8○ 4½″	2–3/4□ 4½″	3/4□–7/8□ 5″	2–7/8□ 5″	2–7/8□ 5″	1□–7/8□ 5″	2–1 1/8○ 5½″	WL/8
Reinf. Joist Wth.	5/8○–5/8□ 4″	2–5/8□ 4″	3/4○–5/8□ 4½″	5/8□–3/4□ 4½″	3/4□–3/4○ 4½″	3/4□–7/8○ 4½″	3/4□–7/8□ 5″	7/8□–7/8○ 5″	7/8□–1○ 5″	7/8□–1□ 5″	WL/9
Reinf. Joist Wth.	2–5/8○ 4″	5/8□–5/8○ 4″	3/4○–5/8○ 4″	3/4○–5/8□ 4½″	2–3/4○ 4½″	7/8○–3/4○ 4½″	2–3/4□ 4½″	2–7/8○ 5″	1○–7/8○ 5″	2–1○ 5″	WL/10
Reinf. Joist Wth.	1/2○–5/8○ 4″	1/2○–5/8□ 4″	1/2□–5/8○ 4″	5/8□–5/8○ 4″	5/8○–3/4○ 4″	2–3/4○ 4½″	5/8□–3/4□ 4½″	3/4□–3/4○ 4½″	3/4□–7/8○ 4½″	3/4□–7/8□ 5″	WL/12
R. M. In ft. lbs.	4190	4750	5060	5480	5810	6760	7300	7590	8650	9640	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
8	655										8
9	518	586	625								9
10	419	475	506	548	581						10
11	346	392	418	453	480						11
12	291	330	351	381	404	470	507	527			12
13	248	281	299	324	344	400	432	449			13
14	214	242	258	280	297	345	372	387	441		14
15	186	211	225	244	258	300	324	337	385		15
16	164	185	198	214	227	264	285	296	338	376	16
17	145	164	175	190	201	233	252	262	299	333	17
18	129	147	156	169	180	209	226	234	267	297	18
19	116	132	140	152	161	187	202	210	240	267	19
20	105	119	127	137	145	169	183	190	216	241	20
21	95	108	115	124	132	153	165	172	196	229	21
22	87	98	105	113	120	139	150	157	179	199	22
23	80	90	96	104	110	128	138	144	163	182	23
24	73	83	88	95	101	117	127	132	150	167	24
25	67	76	81	88	93	108	117	121	138	154	25
26		70	75	81	86	100	108	112	128	143	26
27		65	70	75	80	93	100	104	119	132	27
28			65	70	74	86	93	97	110	123	28
29				65	69	80	87	90	103	115	29
30						75	81	84	96	107	30

Table 40

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	10"
Core—Width	20"
Concrete Slab	3"
Steel @	18,000 #
Concrete @	650 #

Data: Center to Center of Joists / Average Wt. Per Sq. Ft.				4" 24" 68.7 #		4½" 24½" 70.5 #	5" 25" 72.2 #	5½" 25½" 73.8 #			
Reinf. Joist Wth.	2–¾ ○ 4½"	⅝ □–¾ □ 4½"	¾ ○–⅞ ○ 4½"	2–¾ □ 4½"	¾ □–⅞ □ 5"	2–⅞ □ 5"	2–⅞ □ 5"	⅞ □–1 □ 5"	2–1⅛ ○ 5½"	1⅛ ○–1⅛ □ 5½"	$\frac{WL}{8}$
Reinf. Joist Wth.	2–⅝ □ 4½"	⅝ □–¾ ○ 4½"	⅝ □–¾ □ 4½"	¾ ○–¾ □ 4½"	¾ □–⅞ ○ 4½"	¾ □–⅞ □ 5"	⅞ □–⅞ ○ 5"	⅞ □–1 ○ 5"	⅞ □–1 □ 5"	2–1⅛ ○ 5½"	$\frac{WL}{9}$
Reinf. Joist Wth.	⅝ □–⅝ ○ 4"	¾ ○–⅝ ○ 4"	¾ ○–⅝ □ 4½"	2–¾ ○ 4½"	⅞ ○–¾ ○ 4½"	2–¾ □ 4½"	2–⅞ ○ 5"	1 ○–⅞ ○ 5"	2–1 ○ 5"	1 ○–1 □ 5"	$\frac{WL}{10}$
Reinf. Joist Wth.	½ ○–⅝ □ 4"	½ □–⅝ ○ 4"	⅝ ○–⅝ □ 4"	⅝ ○–¾ ○ 4"	2–¾ ○ 4½"	⅝ □–¾ □ 4½"	¾ □–¾ ○ 4½"	¾ □–⅞ ○ 4½"	¾ □–⅞ □ 5"	2–⅞ □ 5"	$\frac{WL}{12}$
R. M. In ft. lbs.	5750	6120	6645	7040	8225	8860	9240	10500	11800	13350	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
8	899										8
9	710	755	820								9
10	575	612	665	704							10
11	475	506	549	582	680						11
12	399	425	461	489	571	615	642				12
13	340	362	393	417	487	524	547				13
14	293	312	339	359	420	452	472	536			14
15	256	272	296	313	366	394	411	467	524		15
16	225	239	260	275	321	346	360	411	461		16
17	199	212	230	244	285	306	320	363	408	462	17
18	178	189	205	217	254	274	285	324	364	413	18
19	160	170	184	195	228	246	256	291	327	370	19
20	144	153	166	176	205	222	231	263	295	334	20
21	131	139	151	159	186	201	210	238	268	303	21
22	119	127	138	145	170	183	191	217	244	276	22
23	109	116	126	133	155	167	175	198	223	252	23
24	100	107	116	122	143	154	160	182	205	232	24
25	92	98	106	113	131	142	148	168	189	214	25
26	85	91	99	104	122	131	137	155	175	197	26
27	79	85	91	97	113	122	127	144	162	183	27
28	74	78	85	90	105	113	118	134	150	170	28
29	69	73	79	84	97	105	110	125	140	159	29
30	64	68	74	78	91	98	103	117	131	148	30

Core—Depth 12″
Core—Width 20″
Concrete Slab 3″
Steel @ 18,000 #
Concrete @ 650 #

Table 41

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data											
Width of Joists			4″		4½″		5″		5½″		
Center to Center of Joists			24″		24½″		25″		25½″		
Average Wt. Per Sq. Ft.			76.0 #		78.2 #		80.2 #		82.2 #		
Reinf. Joist Wth.	⅝□–¾□ 4½″	2–¾□ 4½″	¾□–⅞□ 5″	2–⅞□ 5″	2–⅞□ 5″	⅞□–1□ 5″	2–1⅛○ 5½″	1⅛○–1⅛□ 5½″			$\frac{WL}{8}$
Reinf. Joist Wth.	⅝□–¾○ 4½″	¾○–¾□ 4½″	¾□–⅞○ 4½″	¾□–⅞□ 5″	⅞□–⅞○ 5″	⅞□–1○ 5″	⅞□–1□ 5″	2–1⅛○ 5½″	1⅛○-1⅛□ 5½″		$\frac{WL}{9}$
Reinf. Joist Wth.	¾○–⅝○ 4″	2–⅝○ 4½″	⅞○–¾○ 4½″	2–¾□ 4½″	2–⅞○ 5″	1○–⅞○ 5″	2–1○ 5″	1○–1□ 5″	2–1□ 5″	1⅛□–1□ 5½″	$\frac{WL}{10}$
Reinf. Joist Wth.	½□–⅝○ 4″	⅝○–¾○ 4″	2–¾○ 4½″	⅝□–¾□ 4½″	¾□–¾○ 4½″	¾□–⅞○ 4½″	¾□–⅞□ 5″	2–⅞□ 5″	⅞□–1□ 5″	2–1⅛○ 5½″	$\frac{WL}{12}$
R. M. In ft. lbs.	7210	8280	9660	10430	10850	12420	13960	15760	17560	18930	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
10	721	828									10
11	596	684	798		897						11
12	500	575	671	725	754						12
13	427	490	572	617	642	735					13
14	368	423	493	532	554	634					14
15	320	368	429	464	482	552	621				15
16	282	324	377	407	424	485	546				16
17	249	286	334	360	375	429	483	545			17
18	223	256	298	322	335	383	431	487			18
19	200	230	268	289	301	344	387	437	487	525	19
20	180	207	241	261	271	310	349	394	439	474	20
21	164	188	229	237	246	282	317	358	398	430	21
22	149	171	200	215	224	257	288	326	362	391	22
23	136	157	182	197	205	235	264	298	332	358	23
24	125	144	167	181	188	215	242	274	305	329	24
25	115	133	154	167	174	198	223	252	281	303	25
26	107	123	143	154	161	184	207	233	260	280	26
27	99	114	133	143	149	171	192	216	241	260	27
28	92	106	123	133	138	159	178	201	224	242	28
29	86	99	114	124	129	148	166	188	208	225	29
30	80	92	107	116	121	138	155	175	195	210	30
31	75	86	100	109	113	129	145	164	183	197	31
			94	102	106	121	136	153	172	185	32

Table 42

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	14"
Core—Width	20"
Concrete Slab	3"
Steel @	18,000 #
Concrete @	650 #

... r of Joists / Average Wt. Per Sq. Ft.				4" 24" 83.8 #		4½" 24½" 86.2 #	5" 25" 88.6 #	5½" 25½" 90.8 #			
Reinf. Joist Wth.	2–¾□ 4½"	¾□–⅞□ 5"	2–⅞□ 5"	2–⅞□ 5"	⅞□–1□ 5"	2–1⅛○ 5½"	1⅛○–1⅛□ 5½"				W L / 8
Reinf. Joist Wth.	¾○–¾□ 4½"	¾□–⅞○ 4½"	¾□–⅞□ 5"	⅞□–⅞○ 5"	⅞□–1○ 5"	⅞□–1□ 5"	2–1⅛○ 5½"	1⅛○–1⅛□ 5½"			W L / 9
Reinf. Joist Wth.	2–¾○ 4½"	⅞○–¾○ 4½"	2–¾□ 4½"	2–⅞○ 5"	1○–⅞○ 5"	2–1○ 5"	1○–1□ 5"	2–1□ 5"	1⅛□–1□ 5½"	2–1⅛□ 5½"	W L / 10
Reinf. Joist Wth.	⅝○–¾□ 4"	2–¾○ 4½"	⅝□–¾□ 4½"	¾□–⅞○ 4½"	¾□–⅞○ 4½"	¾□–⅞□ 5"	2–⅞□ 5"	⅞□–1□ 5"	2–1⅛○ 5½"	1⅛○–1⅛□ 5½"	W L / 12
R. M. In ft. lbs.	9540	11120	12000	12500	14300	16100	18160	20220	22200	24600	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
10	954										10
11	788	920	992								11
12	662	772	833	868							12
13	565	658	710	740	847						13
14	487	568	612	638	730	822					14
15	424	494	534	556	636	716					15
16	373	435	469	489	560	639	710				16
17	330	384	415	432	495	556	628				17
18	295	343	371	386	442	497	561	624			18
19	265	308	333	346	396	446	503	561	615		19
20	239	278	300	312	358	403	454	506	556		20
21	216	252	272	284	325	365	412	460	504	558	21
22	198	230	248	258	296	333	375	418	459	508	22
23	181	210	227	236	271	305	344	382	420	465	23
24	166	193	208	217	248	280	315	351	386	427	24
25	153	178	192	200	229	258	291	324	355	394	25
26	141	165	178	185	212	239	269	300	328	364	26
27	131	152	165	172	196	221	249	278	305	338	27
28	122	142	153	160	183	206	232	258	283	314	28
29	114	132	143	149	170	192	216	240	264	292	29
30	106	124	134	139	159	179	202	225	247	274	30
31	100	116	125	130	149	168	189	210	231	256	31
32	93	108	117	122	140	158	177	198	216	240	32

Core—Depth	4″
Core—Width	20″
Concrete Slab	4″
Steel	@ 18,000 #
Concrete	@ 650 #

Table 43

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data											
Width of Joists Center to Center of Joists Average Wt. Per Sq. Ft.				4″ 24″ 61.9 #		4½″ 24½″ 62.5 #					
Reinf. Joist Wth.	2–½□ 4″	2–½□ 4″	½□–⅝○ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	2–⅝□ 4½″	2–¾○ 4½″	⅝□–¾□ 4½″	¾○–¾□ 4½″	¾○–⅞○ 4½″	W L / 8
Reinf. Joist Wth.	½□–½○ 4″	½○–½□ 4″	2–½□ 4″	½□–⅝○ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	2–⅝□ 4½″	⅝□–¾○ 4½″	⅝○–¾□ 4½″	⅝□–¾□ 4½″	W L / 9
Reinf. Joist Wth.	½□–⅝○ 4″	2–½○ 4″	½□–½○ 4″	2–½□ 4″	⅝○–½□ 4″	2–⅝○ 4″	⅝□–⅝○ 4″	¾○–⅝○ 4″	2–⅝□ 4½″	¾○–⅝□ 4½″	W L / 10
Reinf. Joist Wth.	⅝○–½○ 4″	⅝□–½○ 4″	⅝□–½□ 4″	½○–½□ 4″	2–½□ 4″	½□–⅝○ 4″	½○–⅝□ 4″	½□–⅝□ 4″	⅝□–⅝○ 4″	⅝○–⅝□ 4″	W L / 12
R. M. In ft. lbs.	1740	1885	2140	2380	2610	2860	3240	3430	3530	3725	R. M. In ft. lbs.
SPAN IN FEET											**SPAN IN FEET**
6	483										6
7	355	385	437	486							7
8	272	294	334	372	408	447					8
9	215	233	264	294	322	353	400		436		9
10	174	189	214	238	261	286	324	343	353	372	10
11	144	156	177	196	216	236	268	283	292	308	11
12	121	131	149	165	181	198	225	238	245	259	12
13	103	111	126	141	154	169	192	203	209	220	13
14	89	96	109	121	133	146	165	175	180	190	14
15	72	84	95	106	116	127	144	152	157	165	15
16	68	74	84	93	102	111	126	134	138	145	16
17		65	74	82	90	99	112	118	122	129	17
18			66	73	81	88	100	106	109	115	18
19				66	72	79	90	95	98	103	19
20					65	72	81	85	88	93	20
21									80	84	21
22									73	77	22

Table 44

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth		6″
Core—Width		20″
Concrete Slab		4″
Steel	@	18,000 #
Concrete	@	650 #

Data											
Width of Joists / Center to Center of Joists / Average Wt. Per Sq. Ft.				4″ 24″ 67.9 #		4½″ 24½″ 68.9 #	5″ 25″ 69.9 #				
Reinf. Joist Wth.	⅝□–⅝○ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	2–⅝□ 4½″	2–¾○ 4½″	⅝□–¾□ 4½″	2–¾□ 4½″	2–¾□ 4½″	¾□–⅞□ 5″	2–⅞□ 5″	$\frac{WL}{8}$
Reinf. Joist Wth.	2–½□ 4″	½□–⅝○ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	2–⅝□ 4½″	⅝□–¾○ 4½″	⅝○–¾□ 4½″	¾○–¾□ 4½″	¾□–⅞○ 4½″	¾□–⅞□ 5″	$\frac{WL}{9}$
Reinf. Joist Wth.	½○–½□ 4″	2–½□ 4″	⅝○–½□ 4″	2–⅝○ 4″	⅝□–⅝○ 4″	¾○–⅝○ 4″	2–⅝□ 4½″	2–¾○ 4½″	⅞○–¾○ 4½″	2–¾□ 4½″	$\frac{WL}{10}$
Reinf. Joist Wth.	⅝□–½□ 4″	½○–½□ 4″	2–½□ 4″	½○–⅝○ 4″	½○–⅝□ 4″	½□–⅝□ 4″	⅝○–⅝□ 4″	⅝○–¾○ 4″	2–¾○ 4½″	⅝□–¾□ 4½″	$\frac{WL}{12}$
R. M. In ft. lbs.	2790	3120	3420	3750	4250	4500	4650	5200	6040	6450	R. M. In ft. lbs.
7	569	637	699								7
8	436	488	535	587							8
9	344	385	422	463	525	556	574				9
10	279	312	342	375	425	450	465	520			10
11	230	258	282	310	351	372	384	430			11
12	193	217	237	261	295	313	323	361	420	447	12
13	165	185	202	222	252	267	275	307	357	381	13
14	142	159	174	191	217	229	237	266	308	329	14
15	124	139	152	167	189	200	207	231	269	286	15
16	109	122	134	147	166	175	182	203	236	252	16
17	96	108	118	129	147	155	161	180	208	223	17
18	86	96	105	116	131	139	143	161	186	199	18
19	77	87	95	104	118	125	129	144	167	179	19
20	69	78	85	94	106	113	116	130	151	161	20
21		71	78	85	96	102	105	118	137	146	21
22		65	71	78	88	94	96	108	125	133	22
23									114	122	23
24									105	112	24
25									96	103	25
SPAN IN FEET											SPAN IN FEET

Core—Depth	**8"**
Core—Width	**20"**
Concrete Slab	**4"**
Steel	**@ 18,000 #**
Concrete	**@ 650 #**

Table 45

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data	Width of Joists / Center to Center of Joists / Average Wt. Per Sq. Ft.			4" / 24" / 74.1 #		4½" / 24½" / 75.5 #	5" / 25" / 76.9 #	5½" / 25½" / 78.2 #			
Reinf. / Joist Wth.	2-¾ ○ / 4½"	⅝ □-¾ □ / 4½"	¾ ○-⅞ ○ / 4½"	2-¾ □ / 4½"	¾ □-⅞ □ / 5"	2-⅞ □ / 5"	2-⅞ □ / 5"	1 □-⅞ □ / 5"	2-1⅛ ○ / 5½"	2-1 □ / 5"	$\frac{WL}{8}$
Reinf. / Joist Wth.	2-⅝ □ / 4½"	¾ ○-⅝ □ / 4½"	⅝ □-¾ □ / 4½"	¾ □-¾ ○ / 4½"	¾ □-⅞ ○ / 4½"	¾ □-⅞ □ / 5"	⅞ □-⅞ ○ / 5"	⅞ □-1 ○ / 5"	⅞ □-1 □ / 5"	1 ○-1 □ / 5"	$\frac{WL}{9}$
Reinf. / Joist Wth.	⅝ □-⅝ ○ / 4"	¾ ○-⅝ ○ / 4"	¾ ○-⅝ □ / 4½"	2-¾ ○ / 4½"	⅞ ○-¾ ○ / 4½"	2-¾ □ / 4½"	2-⅞ ○ / 5"	1 ○-⅞ ○ / 5"	2-1 ○ / 5"	1 □-⅞ ○ / 5"	$\frac{WL}{10}$
Reinf. / Joist Wth.	½ ○-⅝ □ / 4"	½ □-⅝ ○ / 4"	⅝ ○-⅝ □ / 4"	⅝ ○-¾ ○ / 4"	2-¾ ○ / 4½"	⅝ □-¾ □ / 4½"	¾ □-¾ ○ / 4½"	¾ □-⅞ ○ / 5"	¾ □-⅞ □ / 5"	⅞ ○-⅞ □ / 5"	$\frac{WL}{12}$
R. M. In ft. lbs.	5260	5590	6060	6425	7490	8100	8450	9590	10800	11000	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
8	822										8
9	650	690	749								9
10	526	559	606	643							10
11	434	462	501	531	619						11
12	365	388	421	446	520	562	586				12
13	311	330	358	381	443	469	500				13
14	268	285	309	328	382	413	431	489			14
15	234	248	269	286	332	360	376	427			15
16	205	218	236	251	292	316	330	375	422	430	16
17	182	194	209	223	259	280	292	331	374	381	17
18	162	172	187	198	231	250	260	296	333	340	18
19	145	155	168	178	207	224	234	266	299	305	19
20	131	140	151	160	187	203	211	239	270	275	20
21	119	127	137	146	170	183	192	217	245	250	21
22	108	115	125	133	155	167	175	197	223	227	22
23	100	105	114	121	141	153	160	181	204	208	23
24	91	97	105	111	130	140	147	166	188	191	24
25	84	89	97	103	120	129	135	153	173	176	25
26	78	83	90	95	111	120	125	142	160	163	26
27	72	77	83	88	103	111	116	131	148	151	27
28	67	71	77	82	95	103	108	122	138	140	28
			72	76	89	96	101	114	128	131	29
			67	71	83	90	94	106	120	122	30

Table 46

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth		10″
Core—Width		20″
Concrete Slab		4″
Steel	@	18,000 #
Concrete	@	650 #

ta					
	Width of Joists	4″	4½″	5″	5½″
	Center to Center of Joists	24″	24½″	25″	25½″
	Average Wt. Per Sq. Ft.	80.7 #	82.5 #	84.2 #	85.8 #

Reinf. Joist Wth.	2-¾ ○ 4½″	⅝ □-¾ □ 4½″	¾ ○-⅞ □ 4½″	2-¾ □ 4½″	¾ □-⅞ □ 5″	2-⅞ □ 5″	2-⅞ □ 5″	⅞ □-1 □ 5″	2-1⅛ ○ 5½″	1⅛ ○-1⅛ □ 5½″	$\frac{WL}{8}$
Reinf. Joist Wth.	2-⅝ □ 4½″	⅝ □-¾ ○ 4½″	⅝ □-¾ □ 4½″	¾ ○-¾ □ 4½″	¾ □-⅞ ○ 4½″	¾ □-⅞ □ 5″	⅞ □-⅞ ○ 5″	⅞ □-1 ○ 5″	⅞ □-1 □ 5″	2-1⅛ ○ 5½″	$\frac{WL}{9}$
Reinf. Joist Wth.	⅝ □-⅝ ○ 4″	¾ ○-⅝ ○ 4″	¾ ○-⅝ □ 4½″	2-¾ ○ 4½″	⅞ ○-¾ ○ 4½″	2-¾ □ 4½″	2-⅞ ○ 5″	1 ○-⅞ ○ 5″	2-1 ○ 5″	1 ○-1 □ 5″	$\frac{WL}{10}$
Reinf. Joist Wth.	½ ○-⅝ □ 4″	½ □-⅝ ○ 4″	⅝ ○-⅝ □ 4″	⅝ ○-¾ ○ 4″	2-¾ ○ 4½″	⅝ □-¾ □ 4½″	¾ □-¾ ○ 4½″	¾ □-⅞ ○ 4½″	¾ □-⅞ □ 5″	2-⅞ □ 5″	$\frac{WL}{12}$
R. M. In ft. lbs.	6250	6650	7230	7650	8940	9675	10080	11450	12880	14550	R. M. In ft. lbs
SPAN IN FEET											SPAN IN FEET
8	976										8
9	772	821	894								9
10	625	665	723	765							10
11	516	549	598	632	740						11
12	434	461	502	530	620	672	701				12
13	370	393	427	452	529	572	598	677			13
14	318	339	369	390	455	494	516	584			14
15	278	295	321	340	397	430	450	509	573		15
16	244	259	283	299	349	378	395	447	503		16
17	216	230	250	265	309	334	350	396	446	503	17
18	192	205	223	236	276	298	311	353	398	450	18
19	173	184	200	212	247	268	280	317	357	403	19
20	156	166	181	191	223	242	252	286	322	364	20
21	141	151	164	174	203	219	229	260	292	330	21
22	129	137	149	158	185	200	208	236	266	300	22
23	118	126	137	145	169	182	190	216	244	275	23
24	108	115	126	133	155	167	175	199	224	253	24
25	100	106	116	123	143	154	161	183	206	233	25
26	92	98	107	113	132	143	148	169	190	215	26
27	86	91	99	105	123	132	138	157	177	200	27
28	80	85	92	98	114	123	128	146	164	185	28
29	74	79	86	91	106	115	120	137	153	173	29
30	69	74	80	85	99	107	112	127	143	162	30

Core—Depth 12"
Core—Width 20"
Concrete Slab 4"
Steel @ 18,000 #
Concrete @ 650 #

Table 47

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Data											
Width of Joists				4"		4½"	5"	5½"			
Center to Center of Joists				24"		24½"	25"	25½"			
Average Wt. Per Sq. Ft.				88.0 #		90.2 #	92.2 #	94.2 #			
$\frac{WL}{8}$ Reinf. / Joist Wth.	2-¾□ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"				$\frac{WL}{8}$
$\frac{WL}{9}$ Reinf. / Joist Wth.	¾○-¾□ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	⅞□-⅞○ 5"	⅞□-1○ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"	1⅛□-1⅛○ 5½"		$\frac{WL}{9}$
$\frac{WL}{10}$ Reinf. / Joist Wth.	2-¾○ 4½"	⅞○-¾○ 4½"	2-¾□ 4½"	2-⅞○ 5"	1○-⅞○ 5"	2-1○ 5"	1□-1○ 5"	2-1□ 5"	1⅛□-1□ 5½"	2-1⅛□ 5½"	$\frac{WL}{10}$
$\frac{WL}{12}$ Reinf. / Joist Wth.	¾○-¾○ 4"	2-¾○ 4½"	⅝□-¾□ 4½"	¾□-¾○ 4½"	¾□-⅞○ 4½"	¾□-⅞□ 5"	2-⅞□ 5"	⅞□-1□ 5"	2-1⅛○ 5½"	1⅛○-1⅛□ 5½"	$\frac{WL}{12}$
R. M. In ft. lbs.	8920	10400	11230	11680	13320	15020	16960	18920	20700	22200	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
10	892										10
11	738	860	928								11
12	620	723	780	812							12
13	528	616	665	691	788						13
14	455	531	573	596	680	767					14
15	397	462	500	520	592	668					15
16	349	406	439	456	520	587	663				16
17	308	360	389	403	461	520	586				17
18	276	321	347	360	411	464	523	585			18
19	247	288	311	323	369	416	470	525	573		19
20	223	260	281	292	333	376	424	474	517		20
21	203	236	255	265	302	341	385	430	470	503	21
22	185	215	232	241	275	311	350	391	427	458	22
23	169	197	213	221	252	284	321	358	391	419	23
24	155	181	195	203	232	261	294	329	359	386	24
25	143	167	180	187	213	241	271	303	331	355	25
26	132	154	167	173	197	222	251	280	306	329	26
27	123	143	154	160	183	206	232	260	284	304	27
28	114	133	143	149	170	192	216	242	264	283	28
29	106	124	134	139	159	179	202	225	246	264	29
30	99	116	125	130	148	167	188	211	230	246	30
31	93	108	117	122	139	156	176	197	216	231	31
32	87	101	110	114	130	147	165	185	201	217	32

Table 48

BERLOY FLOOR CORE

Type of Concrete Floor Construction

Safe Total Loads in pounds per square foot.
Weights noted below are for Structural Concrete only.

Core—Depth	**14″**
Core—Width	**20″**
Concrete Slab	**4″**
Steel @	**18,000 #**
Concrete @	**650 #**

Data	Width of Joists Center to Center of Joists Average Wt. Per Sq. Ft.			4″ 24″ 95.8 #		4½″ 24½″ 98.2 #	5″ 25″ 100.6 #	5½″ 25½″ 102.8 #			
Reinf. Joist Wth.	2–¾ □ 4½″	¾ □–⅞ □ 5″	2–⅞ □ 5″	2–⅞ □ 5″	⅞ □–1 □ 5″	2–1⅛ ○ 5½″	1⅛ ○–1⅛ □ 5½″				W L / 8
Reinf. Joist Wth.	¾ □–¾ ○ 4½″	¾ □–⅞ ○ 4½″	¾ □–⅞ □ 5″	⅞ □–⅞ ○ 5″	⅞ □–1 ○ 5″	⅞ □–1 □ 5″	2–1⅛ ○ 5½″	1⅛ ○–1⅛ □ 5½″			W L / 9
Reinf. Joist Wth.	2–¾ ○ 4½″	⅞ ○–¾ ○ 4½″	2–¾ □ 4½″	2–⅞ ○ 5″	1 ○–⅞ ○ 5″	2–1 ○ 5″	1 ○–1 □ 5″	2–1 □ 5″	1⅛ □–1 □ 5½″	2–1⅛ □ 5½″	W L / 10
Reinf. Joist Wth.	⅞ ○–¾ ○ 4″	2–¾ ○ 4½″	⅞ □–¾ □ 4½″	¾ □–¾ ○ 4½″	¾ □–⅞ ○ 4½″	¾ □–⅞ □ 5″	2–⅞ □ 5″	⅞ □–1 □ 5″	2–1⅛ ○ 5½″	1⅛ ○–1⅛ □ 5½″	W L / 12
R. M. In ft. lbs.	10120	11890	12820	13320	15200	17160	19400	21600	23800	26400	R. M. In ft. lbs.
SPAN IN FEET											SPAN IN FEET
11	837	983									11
12	704	825	890	927							12
13	600	703	759	789							13
14	517	606	654	680	776						14
15	450	528	570	592	676	763					15
16	396	465	501	521	594	670	759				16
17	350	411	444	461	525	594	671				17
18	313	366	396	412	470	530	599	667			18
19	281	329	355	370	421	475	538	600	660		19
20	253	297	321	334	380	429	485	540	595		20
21	230	270	291	302	345	390	440	490	540	599	21
22	210	246	265	276	314	355	401	446	492	545	22
23	192	224	242	252	288	324	367	409	451	500	23
24	176	206	222	232	264	298	337	376	413	459	24
25	162	190	205	214	243	274	311	346	381	423	25
26	150	176	190	197	225	254	287	320	352	391	26
27	139	163	176	183	209	236	266	297	327	362	27
28	129	152	164	170	194	219	248	276	304	337	28
29	120	141	152	159	181	204	231	257	284	314	29
30	112	132	142	148	169	191	216	240	265	293	30
31	105	124	133	139	158	179	202	225	248	275	31
32	99	116	125	130	148	168	190	211	233	258	32

INDEX

INDEX—Continued

INDEX---Continued

INDEX---Continued

INDEX---Continued

INDEX---Continued

INDEX---Continued

THE COMMERCIAL PRTG. & LITH
AKRON, OHIO

June 1, 1922

ADDENDA

to First Edition

Berloy Building Materials Hand Book

Description and Load Tables

NEW STANDARD SECTIONS
BERLOY PRESSED STEEL JOISTS

These standards of depth and strength have been adopted by all manufacturers of Pressed Steel Joists.

Revising pages 16 to 20, 23, 24, 36, 37, 44, 45, 56 to 75 and 138 of the Hand Book.

Please cancel these pages as suggested on the sheet of gummed paper enclosed herewith.

This addenda has a glued edge for attachment to the inside of the back cover of the Hand Book.

These new standard sections in sizes 4 to 8 inch inclusive average 2.22% heavier and 7.16% stronger, and sizes 9 to 12 inch inclusive average 17.4% lighter with but 14% decrease in strength. Therefore the new sections are more economical than the old ones.

The new special Berloy joists of .120" thickness are a little heavier than heretofore, and will carry about 5% more than the old tables indicate.

THE BERGER MANUFACTURING CO.
Canton, Ohio.

Addenda June 1st, 1922. Revising page 16
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

SECTIONS OF PRESSED STEEL SHAPES FOR BUILDING CONSTRUCTION

Thickness.

Thickness of material from which Berloy Metal Lumber load-bearing sections are formed varies from .072 inches to .120 inches, and noted as "A" material. Joists and studs of .120 inch thickness are in all cases special, and are used principally for headers, trimmers, etc.

Sections noted as "B" material are of 18 and 20 gauge (U. S. Standard), and designed for non-bearing partitions, ceiling members, furring, etc.

Length.

The maximum length of 60′ 0″ has been established because of shipping limitations.

The lengths of certain sections which can be furnished without splicing are limited, because the formation of the .120 inch thickness sections requires the greater strength of a vertical press over that available in the roll forming machinery, therefore these lengths are limited to the dimensions of the press.

The shorter lengths may be increased by splicing the sections. These splices are located at different places staggered on each side of the joist, which is made possible by the fabrication of I joists from two separate channels. Splices are designed to more than develop the full strength of the section.

Punching Lower Flanges.

Prongs or ⅜ inch holes may be punched in the lower flanges of joists for attachment of lath, in such cases the carrying capacities of the joists will be reduced about 5 per cent.

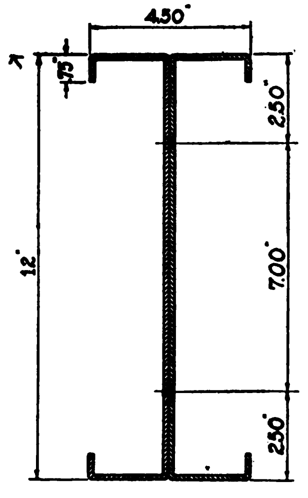
Permissible Variations.

Allowable variation in length, ⅜ inch plus or minus unless ordered cut exact for specific building schedules. Allowable variation in weight 2½ per cent plus or minus, based on published weights.

Addenda June 1st, 1922. Revising page 17
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

STANDARD 12 INCH PRESSED STEEL I JOISTS ("A")



Code word	Depth in inches	Weight per foot in lbs.	Flange width in inches	Flange thickness in inches	Web thickness in inches	Length
zidbe	12	10.5	4½	.090	.180	60′0″
zeawn	12	14.3	4½	.120	.240	12′6″*

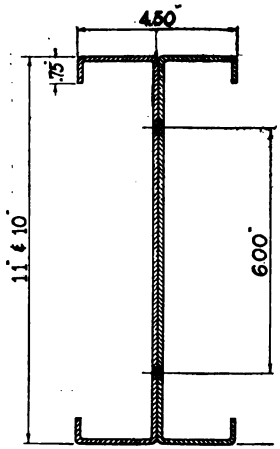
* Special joists. Lengths can be increased by splicing.

Standard sections .090 thickness may be pronged for lath, heavier sections may have ⅜ inch holes punched in lower flange for wiring lath thereto.

Addenda June 1st, 1922. Revising page 18
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

STANDARD 11 AND 10 INCH PRESSED STEEL I JOISTS ("A")



Code word	Depth in inches	Weight per foot in lbs.	Flange width in inches	Flange thickness in inches	Web thickness in inches	Length
ziddo	11	9.5	4½	.086	.172	60′0″
zebov	11	13.5	4½	.120	.240	12′6″*
zideb	10	8.0	4½	.078	.156	60′0″
zebyx	10	12.6	4½	.120	.240	16′8″*

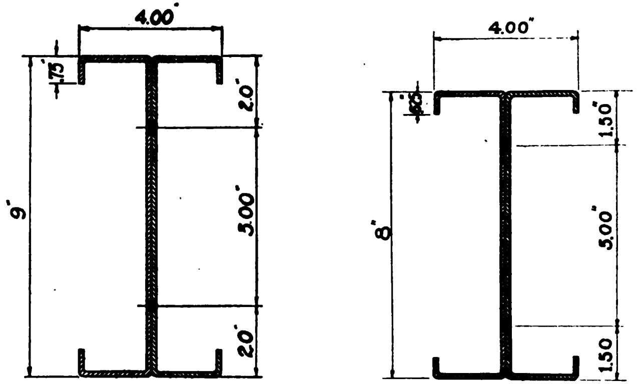
* Special joists. Lengths can be increased by splicing.

Standard sections .078 and .086 thickness may be pronged for lath, heavier sections may have ⅜ inch holes punched in lower flange for wiring lath thereto.

Addenda June 1st, 1922. Revising page 19
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

STANDARD 9 AND 8 INCH PRESSED STEEL I JOISTS ("A")



Code word	Depth in inches	Weight per foot in lbs.	Flange width in inches	Flange thickness in inches	Web thickness in inches	Length
zidgy	9	7.0	4	.075	.150	60'0"
zeciv	9	11.4	4	.120	.240	16'8"*
zidic	8	6.1	4	.072	.144	60'0"
zecte	8	10.5	4	.120	.240	16'8"*

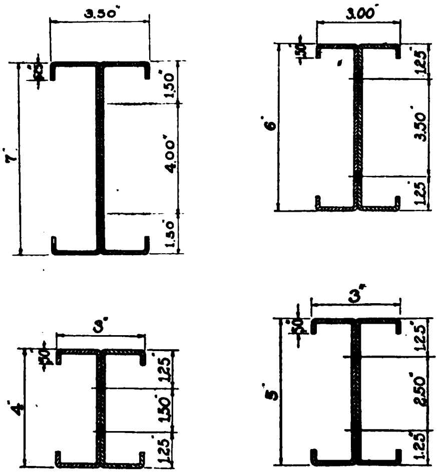
* Special joists. Lengths can be increased by splicing.

Standard sections .072 and .075 thickness may be pronged for lath, heavier sections may have ⅜ inch holes punched in lower flange for wiring lath thereto.

Addenda June 1st, 1922. Revising page 20
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

STANDARD 7, 6, 5 AND 4 INCH PRESSED STEEL I JOISTS ("A")



Code word	Depth in inches	Weight per foot in lbs.	Flange width in inches	Flange thickness in inches	Web thickness in inches	Length
zidod	7	5.5	3½	.072	.144	60'0"
zecwo	7	9.2	3½	.120	.240	16'8"*
ziduf	6	4.7	3	.072	.144	60'0"
zedat	6	7.8	3	.120	.240	16'8"*
zidyg	5	4.2	3	.072	.144	60'0"
zedoy	5	6.9	3	.120	.240	16'8"*
zidza	4	3.7	3	.072	.144	60'0"
zeduz	4	6.1	3	.120	.240	16'8"*

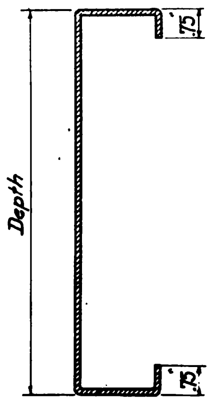
* Special joists. Lengths can be increased by splicing.

Standard sections .072 thickness may be pronged for lath, heavier sections may have ⅜ inch holes punched in lower flange for wiring lath thereto.

Addenda June 1st, 1922. Revising page 23
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

STANDARD 12, 11, 10 AND 9 INCH PRESSED STEEL CHANNEL JOISTS ("A")



Code word	Depth in inches	Weight per foot in lbs.	Flange width in inches	Thickness in inches	Length
zieby	12	5.25	2¼	.090	60′0″
zeebs	12	7.15	2¼	.120	12′6″*
ziegd	11	4.75	2¼	.086	60′0″
zeeld	11	6.75	2¼	.120	12′6″*
zielj	10	4.0	2¼	.078	60′0″
zeeph	10	6.3	2¼	.120	16′8″*
ziemk	9	3.5	2	.075	60′0″
zefav	9	5.7	2	.120	16′8″*

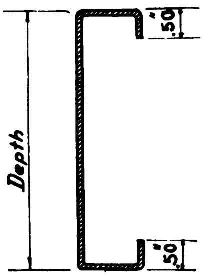
* Special joists. Lengths can be increased by splicing.

Standard sections .075 to .090 thicknesses may be pronged for lath, heavier sections may have ⅜ inch holes punched in lower flange for wiring lath thereto.

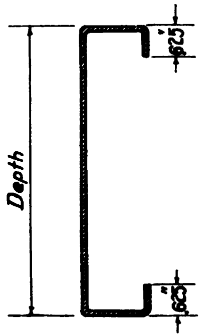
Addenda June 1st, 1922. Revising page 24
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

STANDARD 8, 7, 6, 5, AND 4 INCH PRESSED STEEL CHANNEL JOISTS ("A")



4", 5" and 6" depths



7" and 8" depths

Code word	Depth in inches	Weight per foot in lbs.	Flange width in inches	Thickness in inches	Length
zierp	8	3.05	2	.072	60'0"
zefoz	8	5.25	2	.120	16'8"*
zievs	7	2.75	1¾	.072	60'0"
zefva	7	4.6	1¾	.120	16'8"*
ziewt	6	2.35	1½	.072	60'0"
zefzo	6	3.9	1½	.120	16'8"*
zifab	5	2.1	1½	.072	60'0"
zegiz	5	3.45	1½	.120	16'8"*
zifba	4	1.85	1½	.072	60'0"
zeguc	4	3.05	1½	.120	16'8"*

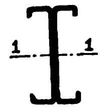
* Special joists. Lengths can be increased by splicing.

Standard sections .072 thickness may be pronged for lath, heavier sections may have ⅜ inch holes punched in lower flange for wiring lath thereto.

Addenda June 1st, 1922. Revising page 36
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

ELEMENTS OF STANDARD I JOISTS



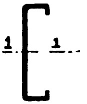
STANDARD SECTIONS, REVISED JUNE 1ST, 1922

Code word	Depth in inches	Weight per foot in lbs.	Area of section in sq. inches	Flange width in inches	Web thick-ness in inches	AXIS 1-1		
						I	r	S
Zidza	4	3.7	1.08	3.00	.144	2.60	1.552	1.3
Zidyg	5	4.2	1.22	3.00	.144	4.38	1.895	1.75
Ziduf	6	4.7	1.37	3.00	.144	6.90	2.244	2.3
Zidod	7	5.5	1.62	3.50	.144	11.20	2.629	3.2
Zidic	8	6.1	1.8	4.00	.144	16.80	3.055	4.2
Zidgy	9	7.0	2.06	4.00	.150	23.85	3.403	5.3
Zideb	10	8.0	2.38	4.50	.156	33.25	3.738	6.65
Ziddo	11	9.5	2.8	4.50	.172	46.20	4.062	8.4
Zidbe	12	10.5	3.1	4.50	.180	60.00	4.399	10.0
SPECIAL SECTIONS—For lengths see pages 3 to 6								
Zeduz	4	6.1	1.80	3.00	.240	4.27	1.540	2.14
Zedoy	5	6.9	2.04	3.00	.240	7.28	1.889	2.91
Zedat	6	7.8	2.28	3.00	.240	11.32	2.228	3.77
Zecwo	7	9.2	2.70	3.50	.240	18.43	2.613	5.26
Zecte	8	10.5	3.09	4.00	.240	27.69	2.994	6.92
Zeciv	9	11.4	3.36	4.00	.240	37.27	3.331	8.28
Zebyx	10	12.6	3.72	4.50	.240	51.13	3.707	10.23
Zebov	11	13.5	3.96	4.50	.240	64.48	4.035	11.72
Zeawn	12	14.3	4.20	4.50	.240	79.82	4.359	13.30

I = Moment of Inertia. r = Radius of Gyration. S = Section Modulus

When joists are pronged or ⅜" holes are punched in lower flanges, the section modulus is reduced about 5%.

Addenda June 1st, 1922. Revising page 37
First Edition, Berloy Building Materials Hand Book



BERLOY METAL LUMBER

ELEMENTS OF STANDARD CHANNEL JOISTS

STANDARD SECTIONS, REVISED JUNE 1ST, 1922

Code word	Depth in inches	Weight per foot in lbs.	Area of section in sq. inches	Flange width in inches	Web thickness in inches	AXIS 1-1		
						I	r	S
Zifba	4	1.85	0.54	1.50	.072	1.30	1.552	0.65
Zifab	5	2.1	0.61	1.50	.072	2.19	1.895	0.88
Ziewt	6	2.35	0.69	1.50	.072	3.45	2.244	1.15
Zievs	7	2.75	0.81	1.75	.072	5.60	2.629	1.60
Zierp	8	3.05	0.90	2.00	.072	8.40	3.055	2.10
Ziemk	9	3.5	1.03	2.00	.075	11.93	3.403	2.65
Zielj	10	4.0	1.19	2.25	.078	16.63	3.738	3.33
Ziegd	11	4.75	1.40	2.25	.086	23.10	4.062	4.20
Zieby	12	5.25	1.55	2.25	.090	30.00	4.399	5.00

SPECIAL SECTIONS—For lengths see pages 7 and 8

Zeguc	4	3.05	0.90	1.50	.120	2.14	1.540	1.07
Zegiz	5	3.45	1.02	1.50	.120	3.64	1.889	1.46
Zefzo	6	3.90	1.14	1.50	.120	5.66	2.228	1.89
Zefva	7	4.60	1.35	1.75	.120	9.22	2.613	2.63
Zefoz	8	5.25	1.55	2.00	.120	13.85	2.994	3.46
Zefav	9	5.7	1.68	2.00	.120	18.64	3.331	4.14
Zeeph	10	6.3	1.86	2.25	.120	25.57	3.707	5.12
Zeeld	11	6.75	1.98	2.25	.120	32.24	4.035	5.86
Zeebs	12	7.15	2.10	2.25	.120	39.91	4.359	6.65

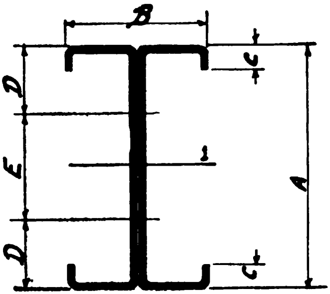
I = Moment of Inertia. r = Radius of Gyration. S = Section Modulus.

When joists are pronged or ⅜" holes are punched in lower flanges, the section modulus is reduced about 5%.

Addenda June 1st, 1922. Revising page 44
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

DIMENSIONS AND PROPERTIES OF STANDARD PRESSED STEEL I JOISTS



STANDARD SECTIONS, REVISED JUNE 1ST, 1922

Code word	Web thickness in inches	Weight per foot in lbs.	Max. length	1–1 Sect. Mod.	Dimensions in inches				
					A	B	C	D	E
Zidza	.144	3.7	60′0″	1.3	4	3	½	1¼	1½
Zidyg	.144	4.2	60′0″	1.75	5	3	½	1¼	2½
Ziduf	.144	4.7	60′0″	2.3	6	3	½	1¼	3½
Zidod	.144	5.5	60′0″	3.2	7	3½	⅝	1½	4
Zidic	.144	6.1	60′0″	4.2	8	4	⅝	1½	5
Zidgy	.150	7.0	60′0″	5.3	9	4	¾	2	5
Zideb	.156	8.0	60′0″	6.65	10	4½	¾	2	6
Ziddo	.172	9.5	60′0″	8.4	11	4½	¾	2½	6
Zidbe	.180	10.5	60′0″	10.0	12	4½	¾	2½	7

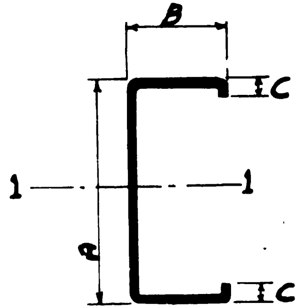
SPECIAL SECTIONS

Zeduz	.240	6.1	16′8″	2.14	4	3	½	1¼	1½
Zedoy	.240	6.9	16′8″	2.91	5	3	½	1¼	2½
Zedat	.240	7.8	16′8″	3.77	6	3	½	1¼	3½
Zecwo	.240	9.2	16′8″	5.26	7	3½	⅝	1½	4
Zecte	.240	10.5	16′8″	6.92	8	4	⅝	1½	5
Zeciv	.240	11.4	16′8″	8.28	9	4	¾	2	5
Zebyx	.240	12.6	16′8″	10.23	10	4½	¾	2	6
Zebov	.240	13.5	12′6″	11.72	11	4½	¾	2½	6
Zeawn	.240	14.3	12′6″	13.30	12	4½	¾	2½	7

The .144 to .180 thicknesses may be pronged for lath; the .240 thickness may have ⅝″ holes punched in lower flanges for wiring lath.
The special sections can be increased in length by splicing.
For special I joist shapes see page 21 of Hand Book. When joists are pronged or ⅝″ holes are punched in lower flanges, the section modulus is reduced about 5%.

Addenda June 1st, 1922. Revising page 45
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER
DIMENSIONS AND PROPERTIES OF STANDARD PRESSED STEEL CHANNEL JOISTS



STANDARD SECTIONS, REVISED JUNE 1ST, 1922

Code word	Web thickness in inches	Weight per foot in lb.	Max. length	1-1 Sect. Mod.	Dimensions in inches		
					A	B	C
Zifba	.072	1.85	60′0″	0.65	4	1½	½
Zifab	.072	2.1	60′0″	0.88	5	1½	½
Ziewt	.072	2.35	60′0″	1.15	6	1½	½
Zievs	.072	2.75	60′0″	1.60	7	1¾	⅝
Zierp	.072	3.05	60′0″	2.10	8	2	⅝
Ziemk	.075	3.5	60′0″	2.65	9	2	¾
Zielj	.078	4.0	60′0″	3.33	10	2¼	¾
Ziegd	.086	4.75	60′0″	4.20	11	2¼	¾
Zieby	.090	5.25	60′0″	5.00	12	2¼	¾
SPECIAL SECTIONS							
Zeguc	.120	3.05	16′8″	1.07	4	1½	½
Zegiz	.120	3.45	16′8″	1.46	5	1½	½
Zefzo	.120	3.90	16′8″	1.89	6	1½	½
Zefva	.120	4.60	16′8″	2.63	7	1¾	⅝
Zefoz	.120	5.25	16′8″	3.46	8	2	⅝
Zefav	.120	5.7	16′8″	4.14	9	2	¾
Zeeph	.120	6.3	16′8″	5.12	10	2¼	¾
Zeeld	.120	6.75	12′6″	5.86	11	2¼	¾
Zeebs	.120	7.15	12′6″	6.65	12	2¼	¾

The .072 to .090 thicknesses may be pronged for lath; the .120 thickness may have ⅜″ holes punched in lower flanges for wiring lath.
The special sections can be increased in length by splicing.
For special channel joist shapes see page 25 of Hand Book. When joists are pronged or ⅜″ holes are punched in lower flanges, the section modulus is reduced about 5%.

Addenda June 1st, 1922. Revising pages 56 and 57
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

Spans 6 to 16 feet. I joist spacings 12 to 24 inches.

STANDARD SECTIONS

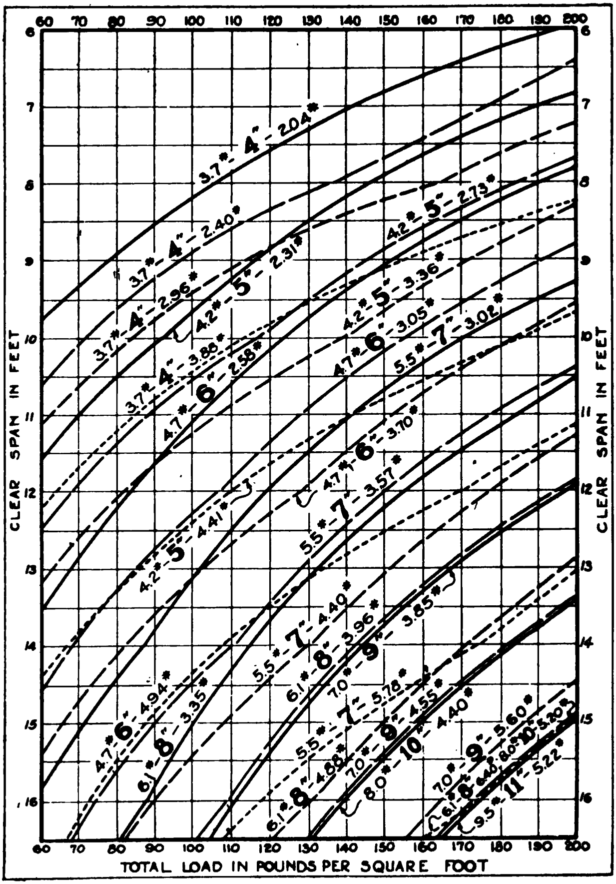


Figure No. 3, see page 55 of Hand Book

Addenda June 1st, 1922. Revising pages 58 and 59
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

Spans 16 to 26 feet. I joist spacings 12 to 24 inches.

STANDARD SECTIONS

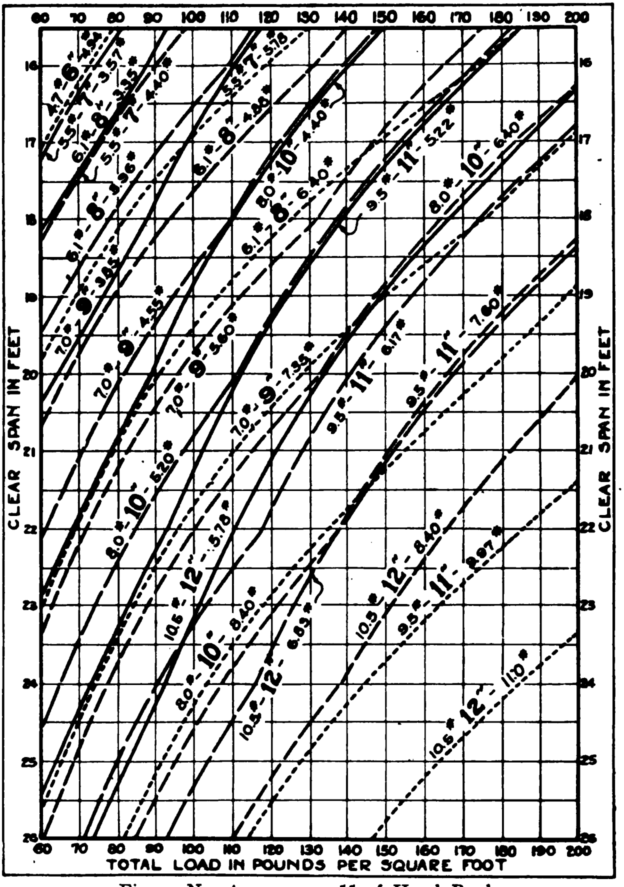


Figure No. 4, see page 55 of Hand Book

Addenda June 1st, 1922. Revising pages 60 and 61
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

Safe Uniform Loads

Standard Metal Lumber I Joists. Total safe loads in pounds. Based on moment of WL/8 and extreme fibre stress of 16000 lbs. per square inch. For details of elements of sections see page 9 of addenda. Loads below heavy lines produce deflections greater than 1/360 of span. Maximum lengths, 60′ 0″.

I JOISTS

Safe Uniform Loads in Pounds. Deflection Line Shown.

DEPTH	4″	5″	6″	7″	8″	9″	10″	11″	12″
WEIGHT	3.7	4.2	4.7	5.5	6.1	7.0	8.0	9.5	10.5
Code Word	Zidza	Zidyg	Piduf	Zidod	Zidic	Zidgy	Zideb	Ziddo	Zidbe
Web Thickness	.144	.144	.144	.144	.144	.150	.156	.172	.180
Section Modulus	1.3	1.75	2.3	3.2	4.2	5.3	6.65	8.4	10.0
CLEAR SPAN IN FEET									
6	2311								
7	1981	2667							
8	1733	2333	3067						
9	1541	2074	2726	3793					
10	1387	1867	2453	3413					
11	1261	1697	2230	3103					
12	1155	1555	2045	2845	3733				
13		1436	1887	2626	3446	4348			
14		1333	1752	2438	3200	4038			
15			1635	2275	2986	3769	4729	5973	7111
16			1533	2133	2800	3533	4433	5600	6666
17				2008	2635	3325	4172	5271	6275
18				1896	2489	3141	3940	4978	5926
19					2358	2975	3733	4716	5614
20					2240	2827	3546	4480	5333
21					2133	2692	3378	4267	5079
22						2570	3224	4073	4848
23						2458	3084	3896	4638
24							2955	3733	4445
25							2837	3584	4267
26							2728	3446	4102

Addenda June 1st, 1922. Revising pages 62 and 63
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

Safe Uniform Loads

Standard Metal Lumber I Joists. Total safe loads in pounds. Based on moment of WL/8 and extreme fibre stress not over 16000 lbs. per square inch. For details of elements of sections see page 9 of addenda. No deflection over 1/360 of span. Maximum lengths, 60′ 0″.

I JOISTS

Safe Uniform Loads in Pounds. No Excessive Deflection.

DEPTH	4″	5″	6″	7″	8″	9″	10″	11″	12″
WEIGHT	3.7	4.2	4.7	5.5	6.1	7.0	8.0	9.5	10.5
Code Word	Zidza	Z dyg	Ziduf	Zidod	Zidic	Zidgy	Zideb	Ziddo	Zidbe
Web Thickness	.144	.144	.144	.144	.144	.150	.156	.172	.180
Section Modulus	1.3	1.75	2.3	3.2	4.2	5.3	6.65	8.4	10.0
CLEAR SPAN IN FEET									
6	2311								
7	1981	2667							
8	1733	2333	3067						
9	1380	2074	2726	3793					
10	1118	1867	2453	3413					
11	922	1550	2230	3103					
12	773	1305	2045	2845	3733				
13		1113	1754	2626	3446	4348			
14		958	1511	2438	3200	4038			
15			1318	2135	2986	3769	4729	5973	7111
16			1159	1880	2800	3533	4433	5600	6666
17				1669	2500	3325	4172	5271	6275
18				1481	2225	3141	3940	4978	5926
19					2000	2844	3733	4716	5614
20					1800	2562	3546	4480	5333
21					1637	2322	3250	4267	5079
22						2120	2942	4073	4848
23						1937	2700	3752	4638
24							2475	3446	4445
25							2285	3181	4133
26							2115	2930	3820

Addenda June 1st, 1922. Revising pages 64 and 65
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

Standard Metal Lumber I Joists. Total safe uniform loads in pounds per square foot. Based on moment of WL/8 and extreme fibre stress not over 16000 lbs. per square inch. For details of elements of sections see page 9 of addenda. Deflection not over 1/360 of span. Maximum lengths, 60′ 0″.

Square Foot Load Joists Spaced 24″ c/c

I JOISTS

Safe Uniform Loads in Pounds. No Excessive Deflection.

DEPTH	4″	5″	6″	7″	8″	9″	10″	11″	12″
WEIGHT	3.7	4.2	4.7	5.5	6.1	7.0	8.0	9.5	10.5
Code Word	Zidza	Zidyg	Ziduf	Zidod	Zidic	Zidgy	Zideb	Ziddo	Zidbe
Web Thickness	.144	.144	.144	.144	.144	.150	.156	.172	.180
Section Modulus	1.3	1.75	2.3	3.2	4.2	5.3	6.65	8.4	10.0
CLEAR SPAN IN FEET									
6	193								
7	142	191							
8	108	146	192						
9	77	115	152	211					
10	56	94	123	171					
11	42	70	102	141					
12	32	54	85	119	156				
13		43	67	101	133	167			
14		34	54	87	115	144			
15			44	71	100	126	158	199	237
16			37	59	88	111	139	175	209
17				49	74	98	123	155	185
18				41	62	88	110	139	165
19					53	75	99	124	148
20					45	64	89	112	134
21					39	56	78	102	121
22						48	67	93	110
23						42	59	82	101
24							52	72	93
25							46	64	83
26							41	57	74

Addenda June 1st, 1922. Revising pages 66 and 67
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

Square Foot Load Joists Spaced 19"c/c

Standard Metal Lumber I Joists. Total safe uniform loads in pounds per square foot. Based on moment of WL/8 and extreme fibre stress not over 16000 lbs. per square inch. For details of elements of sections see page 9 of addenda. Deflection not over 1/360 of span. Maximum lengths, 60′ 0″.

I JOISTS

Safe Uniform Loads in Pounds. No Excessive Deflection.

DEPTH	4"	5"	6"	7"	8"	9"	10"	11"	12"
WEIGHT	3.7	4.2	4.7	5.5	6.1	7.0	8.0	9.5	10.5
Code Word	Zidza	Zidyg	Ziduf	Zidod	Zidic	Zidgy	Zideb	Ziddo	Zidbe
Web Thickness	.144	.144	.144	.144	.144	.150	.156	.172	.180
Section Modulus	1.3	1.75	2.3	3.2	4.2	5.3	6.65	8.4	10.0
CLEAR SPAN IN FEET									
6	244								
7	179	240							
8	137	184	241						
9	97	146	191	266					
10	71	118	155	216					
11	53	89	128	178					
12	40	69	107	149	196				
13		54	85	127	167	211			
14		43	68	110	145	182			
15			55	90	126	159	199	252	299
16			46	74	110	140	175	221	263
17				62	93	124	155	196	233
18				52	78	110	138	175	208
19					66	95	124	157	186
20					57	81	112	141	169
21					49	70	98	128	153
22						61	85	117	139
23						53	74	103	127
24							65	91	117
25							57	80	104
26							51	71	93

Addenda June 1st, 1922. Revising pages 68 and 69
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

Standard Metal Lumber I Joists. Total safe uniform loads in pounds per square foot. Based on moment of WL/8 and extreme fibre stress not over 16000 lbs. per square inch. For details of elements of sections see page 9 of addenda. Deflection not over 1/360 of span. Maximum lengths, 60′ 0″.

Square Foot Load Joists Spaced 16″ c/c

I JOISTS

Safe Uniform Loads in Pounds. No Excessive Deflection.

DEPTH	4″	5″	6″	7″	8″	9″	10″	11″	12″
WEIGHT	3.7	4.2	4.7	5.5	6.1	7.0	8.0	9.5	10.5
Code Word	Zidza	Zidyg	Ziduf	Zidod	Zidic	Zidgy	Zideb	Ziddo	Zidbe
Web Thickness	.144	.144	.144	.144	.144	.150	.156	.172	.180
Section Modulus	1.3	1.75	2.3	3.2	4.2	5.3	6.65	8.4	10.0
CLEAR SPAN IN FEET									
6	289								
7	212	286							
8	163	219	287						
9	116	173	227	316					
10	84	140	184	256					
11	63	106	152	212					
12	48	82	128	178	234				
13		64	101	152	199	251			
14		51	81	130	172	216			
15			66	107	150	188	236	299	356
16			54	88	131	166	208	262	313
17				74	110	147	184	232	277
18				62	93	131	164	208	247
19					79	113	147	186	221
20					68	96	133	168	200
21					58	83	116	152	182
22						72	101	139	165
23						63	88	123	151
24							77	108	139
25							68	95	124
26							61	85	110

Addenda June 1st, 1922. Revising pages 70 and 71
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

Square Foot Load Joists Spaced 12″ c/c

Standard Metal Lumber I Joists. Total safe uniform loads in pounds per square foot. Based on moment of WL/8 and extreme fibre stress not over 16000 lbs. per square inch. For details of elements of sections see page 9 of addenda. Deflection not over 1/360 of span. Maximum lengths, 60′ 0″.

I JOISTS

Safe Uniform Loads in Pounds. No Excessive Deflection.

DEPTH	4″	5″	6″	7″	8″	9″	10″	11″	12″
WEIGHT	3.7	4.2	4.7	5.5	6.1	7.0	8.0	9.5	10.5
Code Word	Zidza	Zidyg	Ziduf	Zidod	Zidic	Zidgy	Zideb	Ziddo	Zidbe
Web Thickness	.144	.144	.144	.144	.144	.150	.156	.172	.180
Section Modulus	1.3	1.75	2.3	3.2	4.2	5.3	6.65	8.4	10.0
CLEAR SPAN IN FEET									
6	385								
7	283	381							
8	217	292	383						
9	154	231	303	421					
10	112	187	245	341					
11	84	141	203	282					
12	64	109	170	237	311				
13		86	134	202	265	334			
14		68	108	174	229	288			
15			88	142	199	251	315	398	474
16			73	118	175	221	277	350	417
17				98	147	196	246	310	369
18				82	124	175	219	277	329
19					105	150	197	248	295
20					90	128	177	224	267
21					78	111	155	203	242
22						96	134	185	220
23						84	117	164	202
24							103	144	185
25							91	127	165
26							81	113	147

Addenda June 1st, 1922. Revising pages 72 and 73
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

Standard Metal Lumber Channel Joists. Total safe loads in pounds. Based moment of WL/8 and an extreme fibre stress of 16000 lbs. per square inch. For details of elements of sections see page 10 of addenda. Loads below heavy lines produce deflections greater than 1/360 of span. Maximum lengths, 60′ 0″.

Safe Uniform Loads

CHANNEL JOISTS

Safe Uniform Loads in Pounds. Deflection Line Shown.

DEPTH	4″	5″	6″	7″	8″	9″	10″	11″	12″
WEIGHT	1.85	2.10	2.35	2.75	3.05	3.50	4.00	4.75	5.25
Code Word	Zifba	Zifab	Ziewt	Zievs	Zierp	Ziemk	Zielj	Ziegd	Zieby
Web Thickness	.072	.072	.072	.072	.072	.075	.078	.086	.090
Section Modulus	.65	.88	1.15	1.60	2.10	2.65	3.33	4.20	5.00
CLEAR SPAN IN FEET									
6	1156								
7	991	1334							
8	867	1167	1534						
9	771	1037	1363	1897					
10	694	934	1227	1707					
11	631	849	1115	1552					
12	578	778	1023	1423	1867				
13		718	944	1313	1723	2174			
14		667	876	1219	1600	2019			
15			818	1138	1493	1885	2365	2987	3556
16			767	1067	1400	1767	2217	2800	3333
17				1004	1318	1663	2086	2636	3138
18				948	1245	1571	1970	2489	2963
19					1179	1488	1867	2358	2807
20					1120	1414	1773	2240	2667
21					1067	1346	1689	2134	2540
22						1285	1612	2037	2424
23						1229	1542	1948	2319
24							1478	1867	2223
25							1419	1792	2134
26							1364	1723	2051

Addenda June 1st, 1922. Revising pages 74 and 75
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

Safe Uniform Loads

Standard Metal Lumber Channel Joists. Total safe loads in pounds. Based on moment of WL/8 and an extreme fibre stress of 16000 lbs. per square inch. For details of elements of sections see page 10 of addenda. No deflection greater than 1/360 of span. Maximum lengths, 60′ 0″.

CHANNEL JOISTS

Safe Uniform Loads in Pounds. No Excessive Deflection.

DEPTH	4″	5″	6″	7″	8″	9″	10″	11″	12″
WEIGHT	1.85	2.10	2.35	2.75	3.05	3.50	4.00	4.75	5.25
Code Word	Zifba	Zifab	Ziewt	Zievs	Zierp	Ziemk	Zielj	Ziegd	Zieby
Web Thickness	.072	.072	.072	.072	.072	.075	.078	.086	.090
Section Modulus	.65	.88	1.15	1.60	2.10	2.65	3.33	4.20	5.00
CLEAR SPAN IN FEET									
6	1156								
7	991	1334							
8	867	1167	1534						
9	690	1037	1363	1897					
10	559	934	1227	1707					
11	461	775	1115	1552					
12	387	653	1023	1423	1867				
13		557	877	1313	1723	2174			
14		479	756	1219	1600	2019			
15			659	1068	1493	1885	2365	2987	3556
16			580	940	1400	1767	2217	2800	3333
17				835	1250	1663	2086	2636	3138
18				741	1113	1571	1970	2489	2963
19					1000	1422	1867	2358	2807
20					900	1281	1773	2240	2667
21					819	1161	1625	2134	2540
22						1060	1471	2037	2424
23						969	1350	1876	2319
24							1238	1723	2223
25							1143	1591	2067
26							1058	1465	1910

Addenda June 1st, 1922. Revising page 138
First Edition, Berloy Building Materials Hand Book

BERLOY METAL LUMBER

APPROXIMATE WEIGHTS OF I JOISTS IN POUNDS PER SQUARE FOOT OF FLOOR

Use net floor area in estimating—material for laps and bearings are included in weights per square foot.

Use B. B. Lath for 12" and 16" spacing.

Use ⅜" Ribplex for 19" and 24" spacing.

Add cost of 50 lineal feet, or 7 lbs. of bridging per 100 square feet of floor. For lath and Ribplex quantities, use net area plus 5%.

STANDARD SPACINGS

12–13½–16–19 and 24 inches on centers

Lineal feet of joists per square foot of floor

		1.05	.94	.80	.65	.55
SPACING		12"	13½"	16"	19" or 20"	24"
4"	3.7 lb.	3.88	3.48	2.96	2.40	2.04
5"	4.2 lb.	4.41	3.95	3.36	2.73	2.31
6"	4.7 lb.	4.94	4.42	3.76	3.05	2.58
7"	5.5 lb.	5.78	5.17	4.40	3.57	3.02
8"	6.1 lb.	6.40	5.73	4.88	3.96	3.35
9"	7.0 lb.	7.35	6.58	5.60	4.55	3.85
10"	8.0 lb.	8.40	7.52	6.40	5.20	4.40
11"	9.5 lb.	9.97	8.92	7.60	6.17	5.22
12"	10.5 lb.	11.00	9.87	8.40	6.83	5.78

Weights given above are approximate for short cut estimating and checking.